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ABSTRACT

This guide has been prepared to assist Oklahoma school officials in developing an energy management plan. It consists of a compilation of materials drawn from a number of local, state, and federal resources. A model organizational structure is shown that could be adapted by each district in organizing an energy plan. The necessity of an energy data base is explained and the elements to be included in the data base (building profile, energy audit, weather data, and transportation data) are discussed. An energy management committee is advised to set up realistic but challenging goals for their energy conservation program. Necessary data are specified for a self-evaluation survey of total school energy consumption in order to determine whether or not the energy conservation program is succeeding. A series of energy saving recommendations are made for specific school departments. The appendices contain reference materials as well as instructions and forms for tabulating and graphing energy consumption. Instructions for describing schools in order to enter data in the Public Schools Energy Conservation Service (PSECS) computer program are also included. (MLF)

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GUIDE TO ENERGY MANAGEMENT IN SCHOOLS

PREPARED BY

OKLAHOMA DEPARTMENT OF EDUCATION

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FUNDED BY

OKLAHOMA DEPARTMENT OF ENERGY

RICHARD G. HILL, DIRECTOR

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FOREWORD

The rapidly rising cost of energy is a major concern of the State Department of Education. Oklahoma public school energy costs increased in FY 1977 over the preceding year by 33%. It is estimated that these costs will more than double in five years.

It is imperative that school officials develop a management plan to meet this situation. The plan's primary objective should be to make our schools more energy efficient thus reducing energy use and costs.

This Energy Management Guide has been prepared to assist school officials in developing an energy management plan. I urge all school officials to apply this guidance in their school districts.

Leslie Fisher
State Superintendent
of Public Instruction

MAR 2 1 1980

ACKNOWLEDGMENTS

This Energy Management Guide consists of a compilation of materials drawn from a number of local, state and federal resources. These materials provide valuable information which can be used by local school districts to establish an effective Energy Management Program.

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INTRODUCTION

These materials have been compiled to assist school administrators in developing an energy management program for their school districts. It is our desire that administrators will use this material as a guide in implementing the steps needed to carry out an effective program.

The concept of energy management has evolved in recent years as a response for dealing effectively with a variety of energy related problems such as increasing costs, decreasing availability, fuel substitution needs, and enviromental concerns. It is generally recognized that energy management involves the following five important elements.

(1). Commitment of management

(2). Organization

(3). Reliable information data base

(4). Program goals, objectives and activities

(5). Evaluation and monitoring

These five elements make up the energy management program and each element will be discussed in the materials that follows. THE PRESENTATION OF THESE ELEMENTS SHOULD BE CONSIDERED ONLY AS A GUIDE SINCE EACH ADMINISTRATOR MUST TAILOR THE PROGRAM TO FIT HIS OWN SPECIFIC NEEDS.

COMMITMENT

The most important elements in implementing an effective energy management program are the commitment and team work of the people involved. School personnel are highly committed to provide quality education for students. They are equally committed to performing the other, supportive tasks necessary to insure that quality education is provided. In recent years a new activity has been added to the long list of tasks for superintendents - Energy Management. School administrators have come to embrace energy management as a valuable tool to assist them in holding down operating expenditures and channeling money into quality educational services.

The commitment begins at the top, with the school board and superintendent. They begin by making the school community aware of problems relative to energy and motivating them to assist in solving those problems.

It is vitally important for the school board and superintendent to officially resolve to eliminate energy waste in their schools and commit the district to an energy management program. A few of the better reasons for beginning an energy management program are as follows:

(1). It can provide the local board of education with a way of retrieving valuable tax dollars that may be wasted by inefficient use of energy.

(2). It can provide the local board of education with a means of alleviating the impact of the energy crisis on schools so that the quantity of energy available will more easily meet local needs.

(3). It can provide the local board of education with a means of improving communication and cooperation between education personnel and the local community.

The Oklahoma State Department of Education, as the first step towards development of a state-wide energy conservation program for educational facilities, is committed to providing materials, guidelines and consultants as well as general assistance in the formation of local energy conservation teams.

Representatives of the Oklahoma State Department of Education are familiar with state and federal legislation governing energy conservation in school facilities and are able to provide local districts with help in meeting pertinent guidelines. The state education department may be called upon for assistance in applying for any state and federal funding which may be available to support energy conservation on the School District level.

ORGANIZE

Once convinced of the need for an Energy Management Program, local district officials must decide how they will react to that need. How does your school district begin to set up such a program?

A good first step is to develop an appropriate organizational structure. A model organizational structure which could be adapted for use by your district is shown in Figure 1. Typical roles might include the following:

School Board and Superintendent

Establish policy which commits the district to a comprehensive energy management plan. This commitment must be fully and effectively explained to all district constituents in such a fashion that there can be no question as to where the school board and superintendent stand.

District Energy Management Committee

Performs policy advisory and overall coordination functions. It is recommended that the District Energy Management Committee be selected by the school board and include:

(1). Member(s) of the school board

(2). Superintendent

(3). District Energy Manager

(4). Director of Maintenance

(5). Director of Transportation

(6). PTA member/parent

(7). Teacher

(8). Student

District Energy Manager

Responsible for administering the Energy Management Plan and is directly accountable to the District Energy Management Committee. Other duties might include the following:

ORGANIZATION

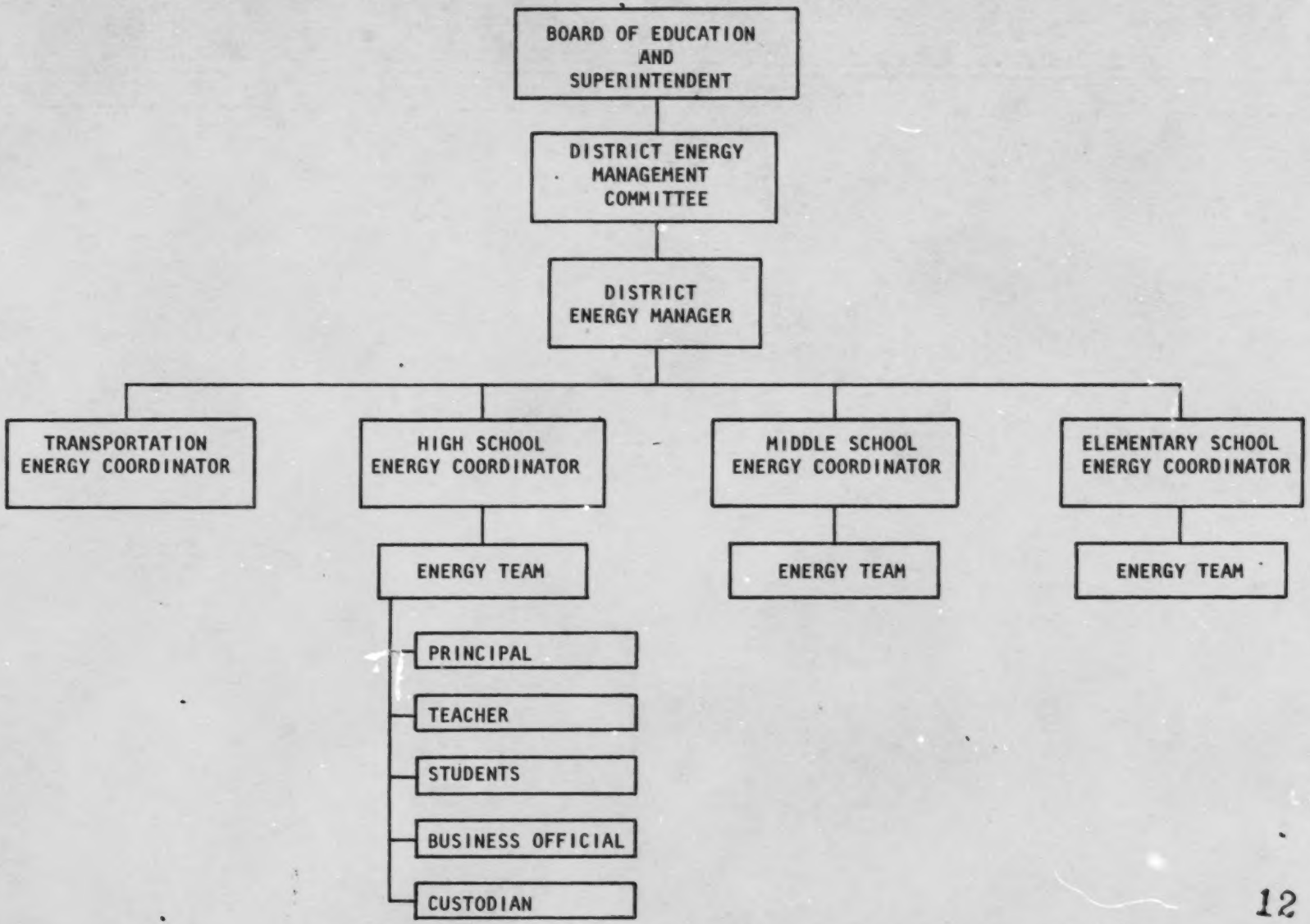

Figure 1

(1). Work with the District Energy Management Committee in setting up energy conservation goals.

(2). Serve as a member of the District Energy Management Committee.

(3). Coordinate in-service education and training on energy conservation programs.

(4). Maintain energy consumption records and make them available as needed.

(5). Provide periodic reports on the energy management program to the District Energy Management Committee.

(6). Coordinate publicity efforts for the energy management program.

Energy Coordinators

Responsible for coordinating the implementation of all conservation activities in his school facilities. Also, works with building principals in setting up energy teams.

Energy Teams

Responsible for implementing and monitoring conservation activities in their areas. In addition to the energy coordinator, the team might consist of the following:

(1). Building principal

(2). Teacher

(3). Student representative

(4). Maintenance and custodial staff supervisor

Roles of Individuals

Principals

The principals should communicate with the district energy manager in

determining how their school compares with the other schools. They should carefully compare energy consumption in their school to anticipated consumption calculated from energy audit information, when available. They should work closely with their schools' energy coordinator in devising ways to increase energy use efficiency. The principal is probably the one person who can make the energy conservation plan succeed because most activities relating to the overall energy management program will involve the principal. Their degree of interest will go a long way in determining the degree of conservation by providing leadership to the department heads, teachers, students, custodians, and other key people within their school campus as to how energy conservation can come about with their cooperation.

Department Heads

Department heads should provide leadership to those within their department in complying with school-wide conservation of energy plans. They should respond to requests of the principal for assistance in devising new and improved conservation techniques especially applicable to their departments. They should provide written material from the overall energy management plan for use by those within the department.

Teachers

The teacher can best serve the overall conservation of energy program in combining operational procedures with the curriculum. Leadership provided by the teacher should be much more of a permanent nature than any other group. The teacher can point out to the students what is being done on the campus and relate these ideas to the educational process. Ideas of the teacher which will add to effective conservation practices should be communicated to the principal and the school energy coordinator.

Students

The student body, comprising the largest group, can contribute more toward the overall conservation of energy program than all others within the Oklahoma Public School Systems. If the students sincerely believe there is a need to conserve energy and if they want to contribute toward the cessation of the depletion of our natural resources, they have the opportunity to pioneer in conservation and to lead other students in the beginning of a conservation revolution that must come. Probably for the first time in their lives they can relate their educational experiences with the actual happenings around them, such as the many practices that other students, custodians and teachers will be making in the battle to conserve energy. They will realize that within their lifetime great changes must come about in how energy is used and if they are to enjoy a full life with ample energy resources available, they must become concerned immediately. The student can provide ideas to the school's energy coordinator and cooperate with district recommendations to conserve energy. They can capitalize upon the energy conservation program by assuming leadership roles and at the same time contribute toward their own future well-being and that of others to follow. Since students are members of the school Energy Conservation Team they have opportunities to inject their philosophies into the operational programs of the school in effective ways. Students have more to gain from a meaningful conservation of energy program than others because they are to be members of society many more years than their mentors. Assistance and cooperation in the conservation of energy programs by the student is a necessity if any conservation program is to work effectively.

Custodian

The custodian will feel the impact of energy conservation and appreciate it more than most other individuals within the public school system. For years they have striven to conserve without much encouragement from others, but now they have the opportunity to feel the participation of every occupant within their school in conserving energy. They should be able to capitalize upon this opportunity and dovetail it with their other duties on the campus. The custodians understand the mechanical equipment within their school and because of this they can be a very vital part of the conservation of energy program. In addition, they can be the connecting link between maintenance personnel and school occupants. Mechanical and control changes that might be implemented by maintenance personnel cannot be effective without the cooperation of the custodian. The custodian should be included in the energy management reports so that they can see how their school compares to others in the use of energy. As a member of the Energy Team of their school, they can provide valuable input as to ways to conserve energy.

Maintenance Personnel

Maintenance department personnel can be providers of very effective ways to conserve energy. Mechanical equipment modifications, control additions or changes, combustion efficiency improvement, building alterations, instructions to occupants and many other techniques that only can be achieved by maintenance personnel can provide greater savings of energy than all housekeeping methods. The one unique feature of maintenance personnel

participation is that all others must cooperate in implementing these changes. The maintenance personnel must continually strive to keep abreast of technical know-how conservation practices and should become as familiar as possible with existing equipment and control features of school buildings within their jurisdiction. They should not be discouraged when others do not accept their recommendations at first, but continue to convince school occupants that mechanical equipment changes and other practices that they recommend will work if given a chance. They should be receptive to ideas of custodians, principals and others offering suggestions relating to conservation practices. The maintenance personnel should be able to provide valuable input to the Energy Team in their school.

ENERGY DATA BASE

INTRODUCTION

Energy management will be an ongoing process for many years. It is, therefore, important to develop an energy data base to serve as a reference point for your energy management program. The data base will initially form the basis on which the district's energy goals and objectives are formulated. Subsequently, the periodic collection and analysis of energy data will provide the basis for evaluating the energy management program.

The data base should be internal as well as external to the fullest extent possible. The internal data base refers to knowledge about the use of energy in the school district whereas the external data base includes knowledge about energy use in general, availability and costs of various forms of energy both currently and in the future, and knowledge about available energy conservation technology.

The development of an energy data base is just a start, but it is a very important start. Without it, one cannot determine areas of excessive energy usage, develop effective methods of management or hope to move beyond the most rudimentary conservation efforts.

Unfortunately, there is no single or unique sequence of items that should be included in the data base. However, experience indicates that the following four items are useful:

(1). Building profile

(2). Energy audit

(3). Weather data

(4). Transportation data

Each item will be discussed in the materials that follows.

BUILDING PROFILE

Basic facts on the physical plant and its functions should be assembled for each school building in the district. Copies of the building site plans and general layout will be useful and should be obtained from the architect. If these are not available, make a sketch. The "building" includes any associated utility (gas, electric, water, etc.) meters and sub-meters related to the building function. The "site" encompasses all buildings, parking areas, and perimeter lighting.

Record the name and location of each school building and its date of construction as well as the total floor space in square feet. Also record information on hours of operation per day for each building.

Prepare a general layout or sketch of a floor plan for each building and include the following:

(1). Identify and show the space allocated to the various functions. Each functional use of the building will have different purpose patterns and different lighting and ventilating requirements.

(2). Identify and locate on the floor plan all gas, electric and water meters. Record their serial numbers for later comparison with billing data.

(3). Identify and locate on the floor plan all energy intensive operations such as boilers, hot water heaters, kitchen ranges, chiller equipment, etc.

ENERGY AUDIT

The basic concept of an energy audit is quite simple. It involves an analysis of a facility to determine the forms of energy used, the quantities and costs of various forms of energy used, the purposes for which energy is being used, and the identification of energy conservation opportunities. The audit process consists of two principal phases:

(1). Billing audit

(2). Building audit

Each of these phases will be discussed separately.

Billing audit

The first phase of the audit is a data collection and analysis phase based on available energy consumption and cost records. The purposes of this phase of the audit process are:

(1). To collect and examine historical energy consumption and energy costs for trends and anomalies.

(2). To measure progress of the energy management program.

The principal source of information concerning historical energy consumption and cost is from utility bills. As trivial as it may seem, experience has shown that many energy consumers do not understand all of the information contained on their utility bills and pay little attention to any information except the dollar cost. If assistance is needed in interpreting utility bills, such assistance can be obtained from the serving utility company. The information which should be extracted from utility bills includes:

(1). Energy consumption

(2). Energy cost

(3). Energy demand

(4). Demand charge

(5). Billing period

Examples of forms which may be useful in recording energy consumption data are shown in Appendix E, Figures 1 through 7. It is desirable to obtain this data for a minimum period of two years and to plot it on a calendar month basis in the form of a bar graph or histogram. The billings for all metered utilities will not necessarily coincide and should be assigned to the month in which the greatest number of days occurred.

An example of a histogram is shown in Appendix E, Figure 8. The advantage of plotting the data is that trends and variations are readily apparent by inspection.

After plotting historical energy consumption and cost data for the previous two year period, the monthly utility data should be recorded and plotted on a continuing basis. Such a continuous procedure will readily indicate trends and/or sudden shifts in energy consumption and costs.

In addition to the information contained on utility bills, district officials should also be thoroughly familiar with the rate structure including such features as the base charge, relation between consumption level and unit charge, demand charge formula, and fuel adjustment clause where applicable.

A frequently overlooked piece of information on utility bills is the demand charge. Although demand reduction will not result in reduction of consumption, it will result in cost savings. The schedule by which energy consuming devices are turned on should be analyzed in an effort to stagger the loading and thereby reduce demand.

It is recommended that the responsibility for recording energy consumption data be assigned to the District Business Office. Utilizing the forms provided and recording the required energy information from the bills as received and processed should not provide any significant burden. The energy manager and other personnel responsible for monitoring or evaluation functions would draw necessary billing data from the business office. A suggested procedure is as follows:

(1). As the bills are received, record cost and consumption for each energy type for each facility on the appropriate monthly consumption form.

(2). At the end of each month, complete the District Monthly Energy Summary and distribute to the superintendent, energy manager and any other monitoring staff.

(3). At the end of the fiscal year, (a) add the consumption and cost data on the facility monthly consumption records to get yearly totals and transfer these figures to the Energy Use History form for each fuel and (b) add the cost and consumption data on the District Monthly Energy Summaries to get yearly figures and transfer this information to the District Yearly Energy Summary Form.

Building Audit

After completing the billing audit phase, the next phase is the building audit. The purposes of this phase of the audit process are:

(1). To observe the operation of school buildings from an energy use perspective.

(2). To identify potential energy conservation measures.

The building audit will usually take one or all of the following forms:

Facility Survey

This is a building inspection which usually takes from one to two hours to perform, in which a team of individuals perform a walk-through to determine readily visible factors affecting energy consumption. The team will usually consist of a local heating and air conditioning specialist, a representative of the utility company, operating personnel of the building and one or more school administrators. The survey team should, after completion of their inspection, prepare a report describing conditions and operations of the facility and recommending corrective procedures that should result in a savings. Appendix D contains a suggested checklist for operations and maintenance implementation.

Energy Audit

This is a brief survey and approximate analysis of a building's energy use patterns, its potential for achieving energy savings through operating

changes or maintenance actions and an assessment of its need for energy conservation measures. The audit has three distinct aspects.

(1). Basic information about the building, such as size, building plan type, energy use in the past, hours of operation and other factors bearing on energy use is gathered either by questionnaire or an on-site visit to the building.

(2). An assessment is made of operating changes or maintenance actions that might improve building energy efficiency.

(3). An assessment is made of the need for energy conservation measures requiring capital outlays. This includes an approximation of costs, benefits and simple payback period associated with each approximate measure.

The Oklahoma State Department of Education recommends use of the "PUBLIC SCHOOLS ENERGY CONSERVATION SERVICE" computer-aided guideline analysis (See Appendix F for current PSECS program). The PSECS computer forms will be made available to the schools along with instructions and assistance in their completion. Processing of the forms will then be handled by the Oklahoma State Department of Education. The results of the PSECS audit can be a very useful and informative complement to an overall energy conservation and management program and the resultant suggestions from the computer output should be implemented as quickly as possible. However, the justification of large capital expenditures will require a more detailed building study.

Technical Assistance Audit

This is a comprehensive, detailed examination requiring trained professionals to perform an engineering analysis of a building's energy conservation potential. This type of analysis is costly, but is the most reliable and productive in terms of potential savings. In the technical assistance audit, a qualified architect, engineer or similarly trained auditor conducts a thorough study of the operating

systems, energy use patterns, historical fuel consumption and related energy costs of a particular building. Initially, the auditor would establish the ideal energy budget that the building would follow if it were running at peak efficiency. Possible energy conservation measures are then precisely analyzed to determine their costs, potential energy savings and projected payback periods. As a result of this analysis, applicable and cost-effective energy conservation measures and projects are recommended for implementation and installation.

WEATHER DATA

Energy consumption is greatly influenced by weather. A practical method used to account for local regional variations in weather is the Degree Day concept.

The amount of energy needed for space heating correlates directly with the difference between 65°F and the outside mean daily temperature. This figure is referred to as the number of heating degree days. For example, if the daily mean (average) temperature were 35°F, the number of heating degree days would be 65 minus 35, or 30. Heating degree days can be added day-by-day to obtain total heating degree days for each month and each heating season (year). Heating degree days can be an effective indicator for estimating energy needed for heating in most schools.

Cooling degree days are analogous to heating degree days. They likewise have a general relationship to cooling needs. The difference between 65°F and the outside mean daily temperature is referred to as the number of cooling degree days. For example, if the daily mean temperature were 85°F, the number of cooling degree days would be 65 minus 85, or -30. The minus sign is an indicator that the resulting figure represents cooling degree days rather than heating degree days. Cooling degree days can also be added day-by-day to obtain total cooling degree days each month and each cooling season (year).

Just as a heating season is characterized by its heating degree days, a cooling season is characterized by its cooling degree days. Both heating and cooling degree days can be obtained each month by calling the local U.S. Weather Service.

Monthly and annual heating degree day normals for Oklahoma are included in Appendix G. Example of a form which may be useful in recording weather data is included in Appendix E, Figure 9.

Weather data for heating degree days and cooling degree days should be recorded on a continuing basis every month. This will provide insight on weather sensitive fuel usage in the district.

TRANSPORTATION DATA

The discussion of the energy data base up to this point has focused primarily on buildings, however, data should also be collected on the district transportation system. The following data should be collected:

(1). Detailed description of all buses and other vehicles.

(2). History of actual energy use by each vehicle for the past year including mileage driven and gasoline consumed.

(3). Types of usage for buses and other vehicles.

(4). Routing information for individual buses, including geographic data for areas served by buses.

(5). Operating schedule and hours of use for each vehicle.

(6). Description of maintenance program.

The above data shows how energy is used in the transportation system and can also be used to provide information on potential energy saving opportunities.

GOALS, OBJECTIVES AND ACTIVITIES

Knowing the commitment and skills of its committee members as well as the financial considerations and motivations involved in a district wide saving of energy, the Energy Management Committee must set up realistic but hopefully challenging goals for their energy conservation program. These goals will state what the program is expected to accomplish and give direction to subsequent decision making. Time frames for the various goals may differ. For example, goals relating to building operation may be instituted almost immediately; however, goals requiring building modification may require extensive time and planning. Regardless of the type of goals decided upon, it is important that all members of the committee participate in their formulation so that there will be communication and cooperation within the committees from the start.

Every journey begins with but a single step and objectives are the steps toward energy conservation goals. Objectives are actually sub-goals themselves. They are little pieces which, when collectively realized, bring completion of one unit of the comprehensive energy conservation program.

After the goals and objectives have been established, committee members will know <u>what</u> needs to be accomplished in each area of responsibility. <u>How</u> to accomplish the goals and objectives will require a multitude of activities on the part of everyone in the district.

The activities themselves are endless. They may range from a simple reduction of thermostat settings, to the removal of alternate fluorescent lights in hallways, to reduction of school bus routes, etc. It should be reiterated however, that these activities will not come about of their own accord. The Energy Management Committee must constantly stress an "energy awareness attitude."

Some thoughts on developing community backing for energy conservation

activities are as follows:

1. Committee must concentrate on attitudes and values, reinforcing positive ones and changing negative or apathetic ones.
2. Technical assistance must be available when and to those who want to do something. "How to do it" should, however, be determined before the interest is created.
3. Reinforcement in terms of data feedback, praise, encouragement, recognition and even monetary compensation are essential. Remember, proper energy conservation can save a great deal of money.
4. Objectives and activities to accomplish them will be better received when they come from within the school, not from outside. Nevertheless, technical assistance and resources are crucial from outside the school.
5. Visible changes are important even if they do not conserve as much, relatively, as non-visible actions. However, take guard against the "Roman Candle" approach. Even though a big, highly visible initiation may be helpful, long run strategies are essential.

Since the energy crisis affects all areas of responsibility in a school district, it is important that the energy conservation program be common knowledge and well communicated to a receptive public.

EVALUATION

In order to determine whether or not the energy conservation program is succeeding, there should be some feedback of information which will help to solidify on-going and future decision-making. Some of the questions the energy management committee will need to ask are:

1. Are committee activities actually being carried through and to what extent?
2. Are committee activities accomplishing their objectives and to what extent?
3. Are the collective objectives accomplishing the program goals?

All three of the above program evaluations will need to be developed and conducted periodically by the energy management committee.

Determining the effectiveness of the programs goals, objectives and activities will indicate whether modification of any of these is necessary for success within the program time frames.

To determine actual and potential school energy savings and impact of the Public School Energy Management Programs, the State Department of Education is requesting on a voluntary basis that school administrators or designated energy managers of schools which have instituted an energy conservation and management program complete a self-evaluation survey of their total school energy consumption. Please include the following data for monitoring purposes:

1. Complete records of amounts of each fuel used in the building as well as expenditures. Records must be complete for the latest available period of operation while an energy conservation plan for the school was in effect. Also, data for identical months, but during a previous base year should be included so that a comparison may be made. Forms which may be useful in recording energy consumption data are shown in Appendix E, Figures 1 through 5.

2. Fill out the questionnaire included herewith.

3. List any major difficulties which might preclude the use of your data for determining energy savings if any.

"FACTORS THAT AFFECT FUEL USAGE IN BUILDINGS"

Please complete the following questions and include a brief description of all items circled "yes," if any. Please attach copies of fuel usage forms completed for both current and base years. All questions are attempting to identify any change in your facility from the base year reported to the current year which might have affected your energy consumption.

1. Has the building(s) been enlarged or reduced in size? Yes No
2. Has the building site or immediate surroundings been modified such as by the addition of new buildings or landscaping which might block out wind or sunshine? Yes No
3. Has another school building or facility been added or removed from the metering system for your school site? Yes No
4. Has the building or its environmental systems been remodeled or physically altered? Yes No
5. Have the hours or manner of use of the building changed significantly? Yes No
6. Has there been a significant increase or decrease in enrollment? Yes No
7. Have any large energy consuming devices or systems such as a number of welders, or perhaps a parking lot lighting system been added? Yes No

Use the following space to describe answers circled "yes" or to indicate anything which in your opinion might have affected energy use in your facility.

A. AGRICULTURAL AND SHOP AREAS

(1). Keep thermostats in shop areas turned down when shop is not in use.

(2). Turn lights off when not in use. Put up signs to this effect at all switches.

(3). Keep doors closed when not in use.

(4). Weather strip all doors and windows.

(5). Use the proper size motor to do the job.

(6). Turn off motors when not in use.

(7). Do not overload equipment.

(8). Use the proper size electrical wire.

(9). When conducting adult classes in buildings connected to the total school heating system, plan classes the same night other activities are going on in the school.

B. ATHLETIC

(1). Encourage the entire coaching staff to keep all night practice sessions to an absolute minimum, as well as to use only those lights necessary for immediate use; utilize natural light whenever and wherever feasible.

(2). Decrease the amount of hot water for use in washing practice uniforms, towels, etc., and in the showering of athletes after vigorous practice sessions, as well as games. Eliminate extra running by removing uniforms from dryers as soon as they are dry. Install shower heads in all athletic facilities that will restrict flow of water.

(3). At night athletic contests, use lights only when absolutely necessary, i.e. turn out lights (stadium and gymnasium) whenever crowds have dispersed.

(4). Lower temperature controls in the gymnasium and locker rooms as well.

(5). Eliminate single car driving by utilizing bus transportation to practice sessions for players and athletic contests by all students and patrons.

(6). Turn out lights in gymnasiums and locker rooms when not in use.

(7). Schedule as many afternoon contests whenever possible, particularly junior varsity and junior high school football and basketball games; consider playing all baseball games in the afternoon.

(8). Curtail indiscriminate use of activity buses for all athletic purposes.

(9). Schedule contests, whenever possible, within a close geographic area in order to curtail travel.

(10). Feature energy conservation tips by announcements made during half time, or as fillers during unusually long time out periods at home athletic contests, in order to reach an important cross section of citizens of all ages.

C. BUSINESS AND OFFICE EDUCATION

(1). Make use of a master switch in laboratories to ensure that all machines are turned off at the end of the school day.

(2). In laboratories not equipped with master switches, caution students to turn off machines when not in use.

D. CULTURAL ARTS

(1). First, in the design of arts spaces and auditorium, sections of space should be independently heated and cooled so that unused space will not use energy. It is common to separate systems in music facilities for sound dampening; other art facilities might lend themselves.

(2). Utilize natural light where feasible.

(3). Schedule classes in large rooms (band, chorus, art, auditorium) back-to-back, and at a time of day when heating is least costly.

(4). Lower temperatures in art rooms; there is usually physical activity.

(5). Reduce temperatures in all storage areas.

(6). Heat only stage areas for rehearsals and work with curtains closed.

(7). Cluster auditorium use (nights and days) to make maximum use during a certain period of time.

(8). Provide for good movement of air in larger rooms to maintain freshness; many times rooms feel stuffy or chilly because air is not moving.

(9). Provide office areas for teachers so large room need not be used for preparatory work, etc.

(10). Put spring closers on doors, especially those leading outside or to cold halls.

(11). Provide alternate levels of light, such as work lights on stage. Use dimmers on classroom lights.

(12). Utilize bus transportation to events and festivals, rehearsals, etc.

E. DISTRIBUTIVE EDUCATION

(1). Place portable glass top display units under windows and discontinue use of lighting built into display case in order to take advantage of natural lighting. In some instances display cases could sit opposite windows and utilize direct sunlight. (Caution should be taken when using borrowed merchandise because it may fade.)

(2). Be sure to cut off lights when classroom is not in use. Have separate lighting switches for classroom, storage area and office space.

(3). Cut off hot water coming into the classroom. Students could get by with cleaning up with only cold water in the laboratory.

(4). Cut off motorized items within displays when facility is not in use.

(5). Cut off display lighting when classroom is not in use.

(6). Cut off hallway display when students leave school.

(7). Use smaller watt bulbs in all display lights.

(8). Use metallic paints and reflective surfaces to decrease the need for lighting in displays.

F. FOOD SERVICES

(1). For a solid-top range, you need only preheat about 10 minutes prior to use.

(2). Keep lids on. For steam-jacketed kettles and range-top pots, use the lids provided and reduce cooking energy 2/3 to 3/4.

(3). Pots with dull-finishes absorb heat better than shiny ones and food cooks faster in them.

(4). If you use the even-heat range top, schedule use of the range top to permit the cooking of several foods at one time. The range works effectively and efficiently when the top is covered with pans.

(5). Turn off cooking and heating units when they are not needed.

(6). Open the oven only when necessary. For every second the door is open, one degree of heat is lost; 10 seconds means 10 degrees of heat is lost.

(7). Schedule the use of ovens so baking can be accomplished in the most efficient manner.

(8). Too frequent opening and closing of refrigerator and freezer doors wastes energy and raises the temperature of the equipment.

(9). Defrosting food in the refrigerator saves energy. The frozen foods keep the refrigerator cool as they thaw. Cooking thawed foods also requires less energy.

(10). Check dishwasher water temperature. Don't use water any hotter than necessary (150 degrees for wash, 160 degrees for power rinse and 180 degrees for final rinse.)

(11). Rinse and stack dirty dishes until enough have been accumulated to warrant the use of the dishwasher.

(12). Clean equipment improves efficiency and efficiency saves energy.

(13). Check equipment periodically. Repair or replace all equipment to keep each piece in top working condition.

(14). If food is transported, review your delivery routes. Evaluate and develop an efficient system combining deliveries and eliminating duplication.

(15). Make sure your transport vehicles are tuned and in good operating condition.

(16). Turn out lights in walk-ins, restrooms, storerooms, dining room when not in use.

(17). Keep ventilation system of refrigeration units clean.

(18). Adjust temperature control on ovens and ranges so as not to preheat above cooking temperature needed for item to be cooked.

(19). Turn off dish machines when not in use.

(20). Replace washers on all leaky faucets.

(21). Repair faulty refrigeration doors.

(22). Keep refrigeration units free of frost build-up.

(23). Schedule carefully all trips into the walk-in refrigeration.

(24). Maintain gaskets on refrigeration units and ranges.

(25). Use natural lighting when possible.

(26). Keep outside doors and storeroom doors closed.

(27). Wear a sweater (white, washable, hard finish type) rather than turn burners or oven on for quick heat.

(28). Schedule equipment so that you use it in sequence. Do not allow to stand idle while hot.

(29). Try to load ovens and kettles to capacity.

(30). Cook foods closer to serving time to eliminate use of energy to keep food hot.

(31). Shut off gas pilot lights during shut-down periods.

(32). Shut off cooking ventilators when not cooking.

(33). If situation becomes critical:

(a). Alter menus to more pre-cooked foods.
(b). Use disposable dinner ware.

G. HEALTH OCCUPATIONS

(1). Cut off ceiling lights when classroom/laboratory area is not in use.

(2). Cut off individual teacher's office lights when not in use.

(3). Unplug electrical sterilizers when not in use.

(4). Unplug microscope light when not in use.

(5). Unplug hot plates when not in use.

(6). Cut off over-bed lamps.

(7). Cut off gooseneck lamps.

(8). Cut off audio/visual projectors' fans.

H. HOME ECONOMICS

(1). Consolidate small baking projects by cooking in one or two ovens.

(2). Use microwave ovens.

(3). Turn out lights in each department area when not in use.

(4). Use dishwashers with energy saver devices.

(5). Use automatic timers.

(6). Use small appliances to supplement or replace large equipment.

I. PLANT OPERATION

(1). Electrical Cost Reduction

Some of the Oklahoma Public Schools are on electrical demand billing rates. The implementation of a well-planned electrical operational program brings about great dollar savings for electrical power where demand billing exists, but there is much less incentive for electrical management programs for schools that are on straight kilowatt hour rates. The shifting of domestic hot water heating, food service baking, some comfort heating, some comfort cooling and shop equipment loads to off campus peak loads to avoid high kilowatt demand recordings is just one of the many electrical management methods. Ideas that may be obtained from conservation method lists, such as removal of some fluorescent tubes, dimming hallways, providing of selective lighting, purchase of watt-saver lamps and fixtures, purchase of energy saving equipment, among hundreds of other available ideas may be used to achieve electrical cost reduction even where demand billing is not available. School energy conservation committees can come up with literally dozens of saving techniques that will be unique to their campuses for application by their school occupants.

(2). Air Conditioning and Heating Systems

(a). Many large buildings have complicated heating, ventilating and air conditioning control systems. Improper adjustment of thermostats can often upset internal balance resulting in an increase in energy used. Therefore, the re-setting of thermostats in such systems should be done only by qualified persons. Double duct and multizone systems are particularly critical in this regard.

(b). For buildings with basic "on-off" types of heating and air conditioning systems:

1. Set thermostats to provide highest acceptable summer temperatures. Try 78 degrees to 79 degrees. For periods of time when the building will not be occupied, set thermostats to 89 degrees or turn the system off.

2. Set thermostats to provide lowest acceptable winter temperatures. Try 64 degrees to 65 degrees. For periods of time when the building will not be occupied set thermostats 5 degrees lower than the setting when occupied. For air-to-air heat pump systems set-back of more than 5 degrees may substantially increase total energy use. For other types of systems, set-back greater than 5 degrees is acceptable. Determine the acceptable point by trial.

3. Provide means to limit access to thermostats after set points are determined.

4. Thermostats should be located in return air paths for forced air systems. Avoid locations on outside walls and on walls adjacent to areas subject to wide temperature variations.

5. Reduce ventilation and exhaust air quantities to minimum acceptable rates.

6. Avoid introducing air with high moisture content into air conditioned space.

7. Keep air filters clean and inspect air duct system for leaks. Repair if necessary and add insulation to ducts where warranted.

8. Check cooling towers and outside air coil heat exchangers. Clean and maintain as required.

9. Inspect and clean indoor air coil heat exchangers on a regular basis.

10. Clean and adjust combustion heat sources for maximum burning efficiency.

11. Inspect pumps and piping for leaks and needed insulation; repair as required.

12. Balance air distribution for desired temperatures throughout the building.

13. Consider the use of infrared heating equipment for poorly insulated or hard-to-heat work areas such as warehouses and loading docks.

14. Consider the use of heat pumps for new or additional heating and cooling requirements.

15. Provide good thermal insulation on hot water, chilled water and steam piping.

16. Keep fan, pump and motor bearings lubricated and verify that belts are all properly adjusted.

17. Consider automatic control for starting and stopping of air conditioning systems.

18. Consider automatic control for starting and set-back of heating systems.

19. Consider control interlock system to prevent simultaneous heating and cooling of the same space.

20. Evaluate the use of package electric boilers to supply steam for small usages when main facilities are not in operation.

(3). Room Type Air Conditioners

(a). Use room or thru-the-wall air conditioning units with high energy efficiency ratio (EER).

$$EER = \frac{\text{BTU per hour cooling rating}}{\text{Watts input or BTU per watt}}$$

A rating of 10 or over is very good; 7-10 is good; 6-7 is marginal; and under 6 is poor.

(b). Install the correct size unit for the area to be cooled. Be sure to consider the number of people normally present in the space, the equipment used in the space and the structural heat gain of the space.

(c). Set unit thermostats at lowest acceptable temperature; determine this by trial.

(d). Filter maintenance is essential. Keep inside and outside heat exchange coils clean and air flow unobstructed.

(4). Service Hot Water

(a). Reduce storage temperature of service hot water to minimum acceptable level.

(b). Minimize use of pumps for circulating hot water supply.

(c). Consider small, point-of-use electric water heaters to replace circulating systems and long pipe runs.

(d). Insulate hot water piping.

(5). Lighting

(a). Clean lighting fixtures on a regular basis to maintain maximum light output.

(b). Replace lamps with badly blackened ends as they are approaching burnout and light output is well below that of new lamps. Consider group lamp replacement programs.

(c). For new installations consider heat-of-light fixtures which will allow heat recovery for re-use and improve lighting fixture efficiency.

(d). Provide additional switching to allow more selective operation of all lighting systems.

(e). Turn off lighting when it is not needed, or when space will not be occupied for one hour or more.

(f). Provide automatic switching for outside area and security lighting equipment. Time clock or photocell control can do the job more reliably than people.

(g). If permanently installed equipment is no longer needed, disconnect the power supply wiring instead of removing lamps. Some fluorescent and H.I.D. fixtures will continue to use energy with lamps removed. Also, ballast damage could occur under this operating condition.

(h). Consider replacing existing lighting systems with new systems using more efficient light sources.

(i). For new installations, consider energy-efficient dimming systems (automatic or manual) for spaces receiving some natural light or where use patterns are subject to wide variation.

(6). General

(a). Do not oversize equipment. Oversizing results in reduced efficiency of operation and higher initial investment and operating costs.

(b). New or replacement equipment should be selected on the basis of highest efficiency consistent with acceptable initial costs.

(c). For new facilities, building orientation is a factor in energy conservation. South and west halls receive more radiant energy than north and east walls.

(d). Energy management programs should provide for capturing and re-using unwanted heat energy produced in a building. Examples: heat rejected by refrigeration systems can be used for space heating; heat in exhaust air can be captured and used to preheat incoming ventilation air.

(e). Relate production to energy used. Energy saved at the expense of production or profit may not be in the users best interests.

J. TRANSPORTATION

Areas of Re-emphasis

(1). School Buses

(a). Refinement of school bus routes.

1. Routes should be consolidated where possible.
2. Unnecessary trips should be eliminated.
3. Unnecessary backtrack mileage should be eliminated.
4. Drivers should be located as near the beginning of the route as possible.
5. Overlapping of routes should be eliminated when possible.

(b). Warm up time at home and at school should be eliminated.

(c). Combine bus stops; reduce to a minimum.

(d). School bus engines should be cut off and brake applied while loading pupils at schools.

(2). Service and Maintenance Vehicle Operation

(a). Plan gasoline disbursement to buses to cut to minimum the possibility of gasoline stealing. (Do not fill tank unless necessary).

(b). Plan parking places for buses at night so as to minimize the possibility of gasoline thefts.

(c). Consolidate bus servicing schedules to cut mileage to a minimum.

(d). Plan oil changing schedules on a mileage basis.

(e). Plan all service truck trips so that maximum use and minimum mileage will result.

(f). Bus gasoline tanks should not be over-filled to prevent leaking after expansion.

(g). All bus and other equipment should be tuned properly.

(h). See that all tires are properly inflated.

(i). Wheel bearings should be adjusted properly.

Areas for Consideration

(1). Discontinue extra use of buses. (Other than transporting pupils to and from school).

(2). Curtail use of activity buses.

(3). Schedule definite driving plan for drivers education cars and school buses.

(4). Keep log on all school vehicles and reduce driving to a minimum.

(5). Reduce speed limit on all school vehicles to 50 m.p.h.

K. VOCATIONAL EDUCATION

General Administration

(1). Do not purchase motorized equipment in excess (h.p.) of that required for proper operation.

(2). Keep motors in good condition - oiled, cleaned and good bearings - to reduce friction.

(3). Install general lighting in zones in order that an entire shop/lab area need not be illuminated.

(4). Utilize "spot-lighting" at work source instead of general overhead lighting.

(5). Isolate work areas that require exterior door openings a major portion of time by using full or partial wall barriers.

(6). Reduce glass areas to an acceptable minimum to reduce heat loss.

(7). Cut off exhaust fans when not needed to limit exchange of hot and cold air.

(8). Use small access doors for exit and entry instead of large overhead doors.

(9). When painting building interiors, select lighter values of all finishes to increase reflected light and reduce need for artificial illumination.

(10). Smoke and fume hoods can be a source of heat loss. Provide dampers in stacks. If motorized, cut operation as soon as smoke and fumes have been removed.

(11). Gas and electric smelting furnaces should be turned off as soon as pouring is completed.

SAVING ENERGY SAVES MONEY . . . .

AND STUDENTS GET TO SPEND WHAT THEY SAVE

A year and a half ago, the New Orleans School District took a look at its past energy costs, projected 1978 gas and electricity use, and made the students an offer: 50% of the energy dollars saved during 1978 would be turned over to the student governments to spend on their choice of capital equipment, supplies, repairs, or renovation. The school system saved over $300,000. that year, and Dr. Gene Geisert, Superintendent of New Orleans Schools, recently returned to the student governments of 88 schools their shares of $159,859. The "rewards," based on the savings achieved at each school, ranged from $125. to $8,486. For their part in the conservation effort, custodial staff at each school will receive 20% of the school's rebate for supplies and equipment. For further information on this effective method of teaching young people that saving energy means saving money, contact Sam Scarnatto, Deputy Superintendent (504) 288-6561 or write 4100 Touro St., New Orleans, LA. 70122.

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Stillwater Public Schools
314 SOUTH LEWIS
Stillwater, Oklahoma 74074

December 10, 1979

Bob Martin, Administrator
School Plant Services
State Department of Education
2500 N. Lincoln Blvd.
Oklahoma City, Oklahoma

Dear Sir:

Attached are the Oklahoma Public School Building Surveys. In addition to specific "measures implemented", operations and maintenance procedures have been implemented along with In-Service for all areas.

The following reductions in gas consumption were made from the base year, October and November, compared to the current year, October and November:

Donart High complex	29%
Highland Park complex	38%
Skyline complex	34%
Westwood complex	44%
Will Rogers complex	45%

These reductions are by total buildings due to having one meter per building.

The electrical for the same periods shows percentage of reduction as per K.W.H. as follows:

Donart High complex *	71.9%
Highland Park Elementary	27%
Westwood Elementary	32%
Will Rogers Elementary	35.6%
Skyline Elementary	10.6%

* Meter reading and/or billing believed to be incorrect.

We have, also, made adjustments as per the printout from the PSECS Audit I.E.

1. Fire lead boiler when outside temperature is 55 and below and overnight temperature of 32 is expected, with the back-up boilers put on the line with outside temperatures below 32.
2. Clean, repair, adjust, change filters at regular intervals.
3. Set back as early as possible.
4. Minimum settings on outside air when heating.
5. Utilizing outside air for cooling when temperature is stable - with chillers off.

Your assistance and leadership in this project is greatly appreciated.

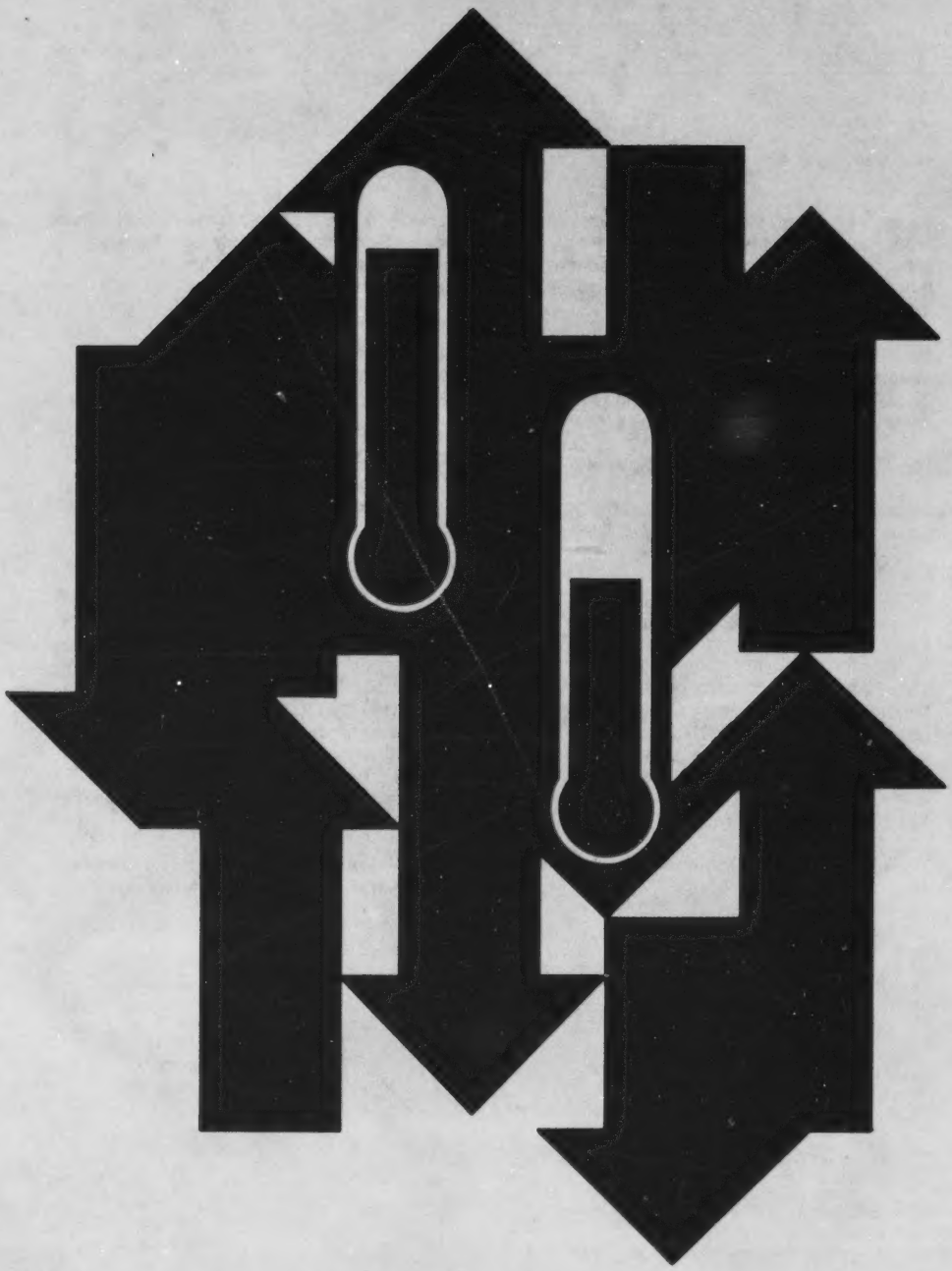
Jack Johnson
Director of Supportive Services
Stillwater Public Schools
215 East 12th
Stillwater, Oklahoma

APPENDIX A

HOW TO COMPLY WITH THE EMERGENCY BUILDING TEMPERATURE RESTRICTIONS

United States
Department
of Energy

HOW TO COMPLY WITH THE EMERGENCY BUILDING TEMPERATURE RESTRICTIONS



Department of Energy
Washington, D.C. 20585

July 1979

MY FELLOW CITIZENS:

There is abundant evidence that serious problems lie ahead for our country unless we act now to avoid them. Unless we act now, there may not be enough fuel oil to adequately heat homes, schools and businesses during the coming winter. Unless we act now, chronic fuel shortages, together with rapidly increasing fuel prices, will threaten our Nation with recession, higher inflation and unemployment.

Nearly half of the oil we use is imported and roughly two-thirds of that is supplied by the member nations of OPEC, the Organization of Petroleum Exporting Countries. OPEC has proven its ability to reduce production and raise prices virtually at will. The price increases announced in June were the steepest since the embargo of 1973.

The Nation must respond to this threat. Our growing dependence on uncertain and costly supplies of imported oil must be reversed. Accordingly, the President has committed the United States to hold oil imports below 8.5 million barrels per day through 1980. He announced that decision after his June meeting in Tokyo with the leaders of six oil-dependent industrial nations, whose concerns reflect our own.

Secondly, the President has determined that a severe energy supply interruption exists and has ordered the immediate imposition of the Standby Emergency Building Temperature Restrictions Plan.

This Plan sets strict limits on heating and cooling temperatures in millions of non-residential buildings throughout the country. I recognize that every citizen may in some way be inconvenienced by the Plan. Each of us may be a little warmer this summer and a little cooler next winter. But it also will help provide needed supplies of heating oil for the winter. It is estimated that, with full compliance nationwide, oil use can be reduced by as much as *400,000* barrels daily. At current OPEC prices, this represents a potential savings to the Nation of more than $2 billion during the projected 9-month life of this program.

The measures called for in this effort are essential, and will prove both effective and equitable. They will help us develop new approaches in our use of energy and move us as a Nation toward wiser energy management.

The Secretary
Department of Energy

INTRODUCTION

What You Must Do With These Instructions

If you are a Building Owner, Operator, or Manager with control over the building's heating, cooling, and hot water system, you must:

- Comply with these regulations, *and*
- Complete the appropriate forms.

If you are a Building Tenant with control over any portion of the building's heating or cooling system, you must:

- Comply with these regulations, *and*
- Forward these instructions to the building owner, operator, or manager.

If you are a Building Tenant with no control over any portion of the building's heating or cooling system, you are requested to:

- Forward these instructions to the building owner, operator, or manager.

The Emergency Building Temperature Restrictions Regulations,[1] effective July 16, 1979, place temporary restrictions on temperatures for heating, cooling, and domestic hot water in commercial, industrial, government, and other nonresidential buildings. The regulations generally require that thermostats be set no lower than 78°F for cooling, no higher than 65°F for heating, and no higher than 105°F for domestic hot water. Provisions are made, however, for maintenance of room temperatures at these limits as an alternative to thermostat settings. The regulations also require room temperature set-backs during periods when the building is unoccupied.

Owners and operators of buildings covered by the regulations are required to post a *Certificate of Building Compliance* in a prominent location in their buildings within 30 days of the effective date of the regulations. Tenants also are required to comply with the regulations although they are *not* required to post a Certificate or file documents with the Government.

Certain types of buildings and portions of certain buildings are excluded from the temperature restrictions. Exemptions also are available under certain specified conditions.

Civil penalties of up to $5,000 and criminal penalties of up to $10,000 are provided for violations of the regulations. The regulations will remain in effect until April 16, 1980, unless rescinded earlier by the President.

[1] *Pursuant to Sections 201(a) and (b) of the* Energy Policy and Conservation Act of 1975 *(42 U.S.C. 6201 et. seq.), the President developed* Standby Conservation Plan No. 2, Emergency Building Temperature Restrictions *(the Plan) and sent it to the Congress on March 1, 1979. The Department of Energy (DOE) published a notice in the* Federal Register *on March 8, 1979 (44 FR 12906), of the President's adoption of the Plan. The Plan was approved by resolutions of the Senate on May 2, 1979, and of the House of Representatives on May 10, 1979. Proposed regulations were published in the* Federal Register *on June 1, 1979 (44 FR 31922). DOE published final regulations in the* Federal Register *on July 5, 1979 (44 FR 39354). On July 10, 1979, the President issued and transmitted to Congress a Proclamation stating his finding that a "severe energy supply interruption . . . currently exists with respect to the supply of imported crude oil and petroleum products" (44 FR 40629). In the Proclamation, the President invoked his authority to implement the emergency building temperature restrictions, and declared July 16, 1979, as the effective date of the Plan and the regulations. DOE published a notice in the* Federal Register *on July 16, 1979, of the effective date of the Plan and the regulations (44 FR 41205).*

REGULATIONS

Part A: How to Determine if the Regulations Apply to Your Building

1. Buildings which are covered. The regulations cover all *non-residential* buildings in the country, unless a building is specifically excluded or exempted.

2. Buildings which are excluded. The regulations exclude all or portions of four types of buildings:

A. Residential Buildings. Buildings, or areas of buildings, used exclusively for residential purposes are not subject to these temperature restrictions. However, non-residential portions of such buildings that have separate heating, cooling or hot water temperature controls, and which are used for commercial, industrial or other business purposes are covered and must comply with the regulations.

B. Hotels and Other Lodging Facilities. Buildings that, in the ordinary course of business, provide lodging or sleeping accomodations to the public or to private guests are not covered by these regulations. However, if the non-sleeping areas of such buildings have separate heating, cooling or water temperature controls, these areas are covered by the regulations. In hotel buildings, for example, the retail stores, restaurants, meeting rooms, lobbies, and offices that have separate temperature controls are covered and must be in compliance with the regulations.

C. Hospitals and Other Health-Care Facilities. Facilities authorized under State law to provide hospital or health-care services (*e.g.,* general or specialized hospitals, clinics, and nursing or convalescent homes) are excluded. However, if the administrative or other portions of such buildings where patient care is not provided have separate heating, cooling or water temperature controls, such areas are covered by the regulations. Medical, dental and nursing school buildings, administrative buildings, and other buildings associated with hospitals and other health-care facilities, but where patients are not treated, are covered and must comply with the regulations. The offices of physicians and dentists are *not* excluded, but an exemption for health-related reasons is available. (For further detail, please see the *Exemption Information Form.*)

D. Elementary Schools, Nursery Schools, and Day-Care Centers. Buildings housing elementary schools (through sixth grade), nursery schools, and day-care centers (as defined by State or local law) are not covered by the regulations. However, if a building is used by both elementary and junior or senior high school level students, and those areas used by junior or senior high school students have separate heating, cooling or water temperature controls, then those areas are covered and must be in compliance with the regulations.

It is possible for *portions of a building* to be excluded while the remainder of the same building is covered by these regulations. If you determine, after careful reading of these instructions, that your entire building comes under one of the exclusions, you need do nothing further. However, if you determine that your building is *not* wholly excluded, you must comply with the regulations.

3. Buildings and facilities which are exempted. A building owner, operator or tenant may be entitled to an *exemption* from the temperature restrictions under certain specified conditions. These exemptions are described on the *Exemption Information Form.* The exemptions are of two types: (1) general exemptions, which relate to the circumstances of a business activity, and (2) system related exemptions, which relate to conditions or operating features of heating, cooling or hot water equipment and systems.

As a rule, the *general* exemptions are available only to that portion or area of a building where the specified conditions exist. For example, an exemption for "special equipment," such as a computer facility, would be available *only* in those areas within the covered building containing such equipment, and in no other areas. Only if the building is served by a single master temperature control does the exemption extend beyond such areas.

Part B: How to Comply with the Regulations — Certificates and Forms

This manual contains three separate forms: (1) *Certificate of Building Compliance,* (2) *Exemption Information Form,* and (3) *Building Compliance Information Form.* Only the owner or operator of the covered building is required to complete these forms. Instructions on the responsibilities and liabilities of *tenants* are presented in Part E, below.

Certificate of Building Compliance: In *all* cases (unless the building is *wholly* excluded), the owner or operator must complete this form, remove it from the manual, and post it in a prominent public location within the building, *e.g.,* lobby or bulletin board. Failure to post this Certificate by August 15, 1979, 30 days after the effective date of the regulations, is a violation subject to penalties. However, delays occurring in the distribution and receipt of the forms will be taken into account in determining compliance with the certification requirement.

Exemption Information Form: This form is to be completed *only* if one or more of the specified exemptions are claimed for areas within a covered building, or if a special *exception* has been granted by DOE. If *exemptions* are claimed by tenants of the building, the building owner or operator is advised to obtain a written statement from such tenants which describes and justifies the claimed exemption(s). Such support documentation should be retained by the owner/operator, along with the Form, and must be available for review in the event of an inspection of the building.

Important Note: *You are* not *required to apply to DOE for an exemption from these temperature restrictions. Any authorized exemption (as specified on the* Exemption Information Form*) becomes effective immediately upon your completion of the Form. You may be subject to a penalty, however, if a claimed exemption is determined to be invalid upon a later inspection and ruling by DOE. A building owner or operator shall* not *be liable for penalties as a result of an invalid exemption claimed by a tenant.*

Building Compliance Information Form: Submittal of this form is mandatory only if claiming an exemption. Those claiming an exemption must complete the Form and return it to DOE with proper postage by August 15, 1979, or within 10 days after receipt of this manual, whichever is later.

Part C: How to Comply with the Regulations — Adjusting Air Temperatures

1. Heating and Cooling Temperature Restrictions. The regulations divide heating, ventilating, and air-conditioning (HVAC) systems into two basic categories: (1) simple systems which, at any given time, can either heat or cool, but cannot heat and cool simultaneously, and (2) compound or integrated systems which have the capability to heat and cool simultaneously, or heat one area of a building while cooling another.

These instructions cover those periods when the building is normally occupied. A building is considered *occupied,* day or night, when all or part of it is used for ordinary or customary functions, but *not* including such daily service functions as cleaning and maintenance. Instructions for heating and cooling during unoccupied periods are provided below.

A. Simple Systems: When the cooling system is operating, the thermostats shall be set so that no cooling energy is used to lower the room temperature below 78°F. When the heating system is operating, thermostats shall be set so that no heating energy is used to raise the room temperature above 65°F. (The temperature is to be measured with a "dry-bulb," or ordinary thermometer.) However, when cooling, the dry-bulb temperature may be lowered below 78°F to the extent necessary to lower the room "dew-point" temperature to not lower

than 65°F. (Dew-point temperature is a measure of humidity. Instructions on how to determine the dew-point temperature are provided below under *Temperature Measurement Techniques.*)

You may comply with these requirements by simply setting the thermostat(s) to the required point, *i.e.*, 78°F when cooling or 65°F when heating, or you may comply by adjusting the thermostat(s) so that the room air temperature is maintained at the prescribed levels. For further instructions, see *Temperature Measurement Techniques,* below.

B. Compound or Integrated Systems: These systems include dual-duct, reheat, recool, multizone fans, fan-coil units in combination with central air or refrigerant, induction units in combination with central air, central systems with independent window air-conditioners or heat pumps, and similar systems. Several alternatives are provided for compliance in buildings with these systems, depending upon the type or configuration of HVAC system used.

1. The building owner/operator may set each temperature control device so the dry-bulb temperature (as measured in *any* room controlled by the *same* device) is not lower than 78°F when cooling or higher than 65°F when heating. For example, if the air temperature in three separate rooms is controlled by one thermostat, you may use the measured dry-bulb temperature in any one of those rooms to determine whether you are in compliance with the regulations, *regardless of the thermostat setting.* This same approach may be applied to control the dew-point temperature.

2. Alternatively, the owner/operator may use one of the compliance strategies outlined below:

a. Heating coils combined with constant-air-volume and/or variable-air-volume HVAC systems. In such systems, the heating coils used for exterior zones of a building typically are located in fan-coil units, induction units, baseboard heaters or similar units. To be in compliance, you may set the air-temperature control devices so that:

- When cooling, no heat is provided to the heating unit;
- At all times, no coolant liquid *e.g.*, chilled water or refrigerant, is supplied to the cooling coils at temperatures below 55°F; and
- When heating, the room dry-bulb temperature is maintained not higher than 65°F.

b. Central chiller/heat pump HVAC systems. Such systems typically use a central chiller to supply cool air to the inner core of the building and circulate the warm condenser water from the chiller to the exterior rooms where heat is extracted by room heat pumps. For such systems, the building shall not be cooled below 78°F. When heating, the exterior zones shall not be heated above 65°F.

c. Constant or variable-air-volume-with-reheat and variable-air-volume ("all-air") systems: To be in compliance, set air temperature control devices so that:

- At all times, the temperature of the air leaving the cooling coils is at least 60°F; and
- When cooling, the heating system is turned OFF and the thermostats (or other local temperature control devices) are set at 78°F; and
- When heating, the cooling system is turned OFF and the thermostats are set at 65°F.

3. Instead of using any of the above compliance strategies, the owner/operator may use an alternative approach if a licensed professional engineer certifies it will consume less energy for heating and cooling the building than the approaches described above. However, such an alternative approach must include adjusting the cooling system so that: (a) no liquid coolant is provided to cooling coils at a temperature below 55°F; *or* (b) the dry-bulb temperature of air leaving the cooling coils is 60°F or higher.

Important Note: *You may alternate at any time between the compliance strategies described in B-1, B-2, and B-3, above, to achieve permissible temperature levels. For example, with a fan-coil system, if room temperature when cooling cannot be reduced to 78° F with a circulated chilled water temperature of 55° F, you may lower the temperature of the chilled water. In doing so, however, you must then insure that room air temperature is not lowered below 78° F. If at another time, outside air temperatures or*

interior heat loads should be reduced, you may adopt the alternative approach of maintaining chilled water at 55° F, or higher, regardless of the actual room air temperatures. Other actions may improve levels of comfort. Fans will assist the normal movement of air. Windows may be better insulated with shades or drapes. People may be moved away from hot or cold exterior walls and windows.

2. Temperature Restrictions When a Building is Unoccupied. These provisions apply to *all* covered buildings, whether they have simple or complex HVAC systems.

HVAC systems must be turned OFF when a building is to be unoccupied for 8 hours or more, unless damage would occur to the building or its contents *or* the minimum anticipated outdoor air temperature (dry-bulb) during the unoccupied period is expected to be lower than 50° F.

In the latter case, the temperature control devices must be set so that either: (a) the room dry-bulb temperature is not greater than 55° F, *or* (b) the heated supply-air dry-bulb temperature is less than 100° F, *or* (c) the heating-water temperature is less than 120° F, *or* (d) the room air temperature control devices are set to a level not higher than 55° F, or at their lowest set-point. Both heating and cooling systems may be turned OFF by turning off the circulating air or circulating water systems.

3. Temperature Measurement Techniques. To determine whether a building is in compliance with these temperature restrictions, any one of the following measurement techniques may be used:

A. Compliance may be shown by reading the set-point of the thermostat. Building owners/operators are required to maintain thermostats at reasonable tolerances of accuracy. Any intentional alteration or damaging of such devices to produce inaccurate readings is a violation of the regulations.

B. Alternatively, measurements of the actual room temperature and humidity levels may be made by the following means:

- For measuring dry-bulb temperatures:
  - Reading a thermometer placed within two feet of the thermostat; or
  - Averaging the thermometer readings taken two feet away from and at the center of each external wall in the room, and at the center of the room; or
  - Taking the temperature at the center of the room if there are no external walls.
- For measuring dew-point temperature:
  - Using an instrument that indicates dew-point temperature; or
  - Inference from the dry-bulb temperature and relative humidity (See Table 1 below.)
- For measuring relative humidity:
  - A humidity-indicating device (hygrometer); or
  - Inference from the dew-point or from wet-bulb and dry-bulb temperature measurements (psychrometer).
- For measuring wet-bulb temperature:
  - An instrument for measuring wet-bulb temperature (psychrometer); or
  - Inference from the dew-point temperature or relative humidity.

Dew-point or wet-bulb temperatures and relative humidity may be measured within two feet of the humidity space-conditioning control device (humidistat), if located in the room, or in the same location used in measuring the dry-bulb temperature. To allow for HVAC system cycling, several temperature and humidity readings may be spaced to accommodate the time needed for compressors to go through their "on-off" cycles. Where an air-temperature control device controls the temperature in more than one room, the measurement(s) may be made in any one room controlled by that device.

4. Use of Portable Heaters and Ventilating Equipment. The use of auxiliary heating devices, *e.g.*, portable electric heaters or heat lamps, is prohibited, except: (1) when the room dry-bulb temperature is below 65° F, or (2) to provide spot heating when the building is unoccupied. For example, a person working overtime may use auxiliary heating equipment.

The use of ventilating fans or ventilating systems is authorized, even when such use will raise the room temperature above 65° F (dry-bulb) or lower it below 78° F (dry-bulb). The use of free-standing fans within rooms is authorized at all times.

Table 1: Dew-point temperature (°F) estimated from measurements of dry-bulb temperature and relative humidity.

Dry-Bulb Temperature (°F)	Relative Humidity (Percent)				
	50	60	70	80	90
70	51°	56°	60°	64°	67°
75	55°	60°	65°	68°	72°
78	58°	63°	67°	71°	75°
80	60°	65°	69°	73°	77°
85	64°	70°	74°	78°	82°

Using an ordinary thermometer and a relative humidity gauge, the approximate dew-point temperature can be estimated from this Table. Example: If the indoor dry-bulb temperature measures 78°F and the relative humidity (measured within the room) is 70 percent, the dew-point temperature is approximately 67°F. Under these conditions, the thermostat may be lowered below 78°F to reduce the dew-point temperature to not more than 65°F. This may be done by first lowering the thermostat one degree to 77°F, and rechecking the relative humidity after the room temperature has stabilized. If the estimated dew-point temperature is still above 65°F, the thermostat may be lowered slightly again, and this process repeated until the estimated dew-point is 65°F.

Part D: How to Comply with the Regulations — Adjusting Water Temperatures

These restrictions apply only to "domestic" hot water — that is, water used for personal hygiene or general cleaning, for example, in rest rooms or janitorial facilities. Temperature control devices for domestic hot water must be set at 105°F or the lowest setting on the control device, whichever is higher. When a building is unoccupied for more than eight hours, the domestic hot-water circulating system pumps (if any) must be turned OFF, unless this would damage the building, its systems, or its internal processes. Exemptions from these requirements are described on the *Exemption Information Form.*

Compliance with the hot-water temperature restrictions may be determined by measuring the water temperature:

a. in the hot-water supply line; or

b. at the tank temperature control point; or

c. at the tap nearest to the tank discharge point.

Some systems may not have large hot-water storage capacity. In such cases, operators may take advantage of option "c" by installing a mixing valve between the hot-water tank and the nearest tap. This will allow water in the storage tank to be heated above 105°F.

Water temperature control devices must be maintained within reasonable tolerances of accuracy, and any alteration with the intent of having that device function inaccurately is prohibited.

Part E: Tenant Responsibilities

Tenants of buildings covered by these regulations who have control of temperature control devices such as wall thermostats and window air-conditioners are required to maintain such devices at the levels required by the regulations. Failure to comply with these requirements is a violation subject to penalties.

A tenant entitled to an exemption is required to notify the building owner or operator in writing of such exemption. The exemption becomes effective upon notification of the owner/operator. The owner/operator will attach the claimed exemption to the *Exemption Information Form* which he is required to complete and retain on file.

Part F: Special Exceptions

In addition to the exemptions (see the *Exemption Information Form*), *special exceptions* will be granted when these regulations create special hardship, inequity, or an unfair distribution of the burden. Applications for *special exceptions* must be in writing and signed by the person or persons so affected. The application should set forth the revelant facts and explain why these regulations create a special hardship, inequity, or an unfair distribution of the burden. The building (or area therein) in which the requested exception would apply also should be identified.

Tear along perforation

CS-198

Form Approved OMB No. 038-S79046

EMERGENCY BUILDING TEMPERATURE RESTRICTIONS CERTIFICATE OF BUILDING COMPLIANCE

Building Name

Address

Telephone | No. of Stories | No. of Square Ft.

This is to certify that the undersigned is in compliance with the Emergency Building Temperature Restrictions Plan. Accordingly, the cooling, heating, and hot water temperatures of these premises have been adjusted in an attempt to achieve the reductions in energy consumption contemplated under the emergency measures.

(Check Appropriate Category)

☐ Full Compliance

☐ Exempted Compliance
(See Building Manager for Exemption Details)

☐ Excepted From Compliance
(See Building Manager for Exception Application)

Building Owner or Operator (Signature)

Date

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CS-198

Form Approved
OMB No. 038-S79048

U.S. DEPARTMENT OF ENERGY
EXEMPTION INFORMATION FORM

Building owners or operators must complete this form and keep it on file.
Please do not forward the form to the Department of Energy.

1. Respondent/Building Identification

(Respondent's Name)

(Building Address)

(Respondent's Area Code and Telephone Number)

2. Building Owner Identification (if different)

(Owner's Name)

(Owner's Address, if different)

(Owner's Area Code and Telephone Number, if different)

3. Building Type (Please Check One)

- ☐ A. industrial/manufacturing
- ☐ B. school
- ☐ C. restaurant
- ☐ D. retail store (other than retail food store)
- ☐ E. hospital/health care
- ☐ F. office
- ☐ G. hotel/lodging
- ☐ H. shopping center
- ☐ I. warehouse
- ☐ J. retail food store
- ☐ K. combination of above (please specify letters)
- ☐ L. other (please specify) _____

4. Exemption Information

Instructions. You are entitled to claim exemption for as much of the building's area as is required to provide necessary temperatures to exempt areas. Exemptions shall become effective when claimed. There are two types of exemptions: (1) a general exemption which results from a situation of your business, and (2) a system-specific exemption due to the nature of your building's heating and cooling and/or hot water systems. Please check the exemption(s) that apply to your building. Note that section numbers refer to Department of Energy regulations (44 FR 39354, July 5, 1979).

General exemptions (490.31)

- ☐ A. Maintenance of specified temperature levels is required by manufacturer's warranty (or other applicable instructions or equipment service contracts) to prevent damage to special equipment. 490.31(a)(1) *Example:* computer rooms.
- ☐ B. Maintenance of specified temperature and humidity levels is critical to materials and equipment used in manufacturing, industrial or commercial processes. 490.31(a)(2) *Examples:* freeze drying, certain printing processes, and manufacturing and handling of explosives.
- ☐ C. Maintenance of specified temperature and humidity levels is required for proper storage or handling of food or other agricultural commodities, raw materials, goods in process, and finished goods. 490.31(a)(3) *Example:* perishable-food warehouses.
- ☐ D. Special environmental conditions are required to protect plant or animal life or materials essential to the operation of a business. 490.31(a)(4) *Examples:* greenhouses, museums, certain laboratories, art galleries, zoos, and veterinary hospitals.
- ☐ E. Maintenance of specific temperature levels is required to protect the health of persons 490.31(a)(5):

  (i) in offices of physicians, dentists, and other members of health care professions licensed by the state to provide health-related services; or

  (ii) engaged in rehabilitative physical therapy in physical therapy facilities; or

  (iii) utilizing indoor swimming pools. (This exemption applies only to heating restrictions.)
- ☐ F. Maintenance of specific temperature or humidity levels is required to prevent damage to the structure or insulation of the building. 490.31(a)(6)

System-specific exemptions (490.18)

Exemptions affecting heating and cooling systems (490.18)

☐ **G.** Buildings or portions thereof which are neither heated nor cooled; and buildings or portions thereof which are equipped with space heating devices and space cooling devices with total rated output less than 3.5 Btu per hour (1 watt) per square foot of gross floor area. (You should be able to find the output on a label on the equipment, in the manufacturer's literature, or in the warranty statement.) 490.18(a)(1)

☐ **H.** Buildings that are cooled by a heating, ventilating, and air conditioning (HVAC) system capable of using outdoor air or evaporation of water for cooling effect without operation of a vapor compression or absorption-refrigeration system. (Applicable only at those times when such a system is used for cooling and when the outdoor air and/or evaporator effect provides the only cooling source.) 490.18(a)(2)

☐ **I.** Buildings that use otherwise wasted energy in, or to power, HVAC systems. (Applicable only at those times when wasted energy is the only source of heating and cooling energy.) 490.18(a)(3)

☐ **J.** Buildings that use solar HVAC systems. (Applicable only at those times when solar energy is the only source of heating and cooling energy.) 490.18(a)(4)

☐ **K.** Buildings that have HVAC systems whose capacity is insufficient to maintain the building at minimum authorized temperature or humidity levels for cooling. The reduced temperature levels may be maintained only for the period necessary for the temperature to reach the minimum level otherwise permitted during the building's occupied period. 490.18(b)

☐ **L.** If a licensed Professional Engineer (P.E.) certifies that operation of the HVAC system in accordance with the regulations will result in consumption of more energy than will some alternate procedure and the owner/operator agrees to implement this alternate procedure. 490.12(e)(1)

Exemptions affecting hot water systems (490.24)

☐ **M.** Buildings where the domestic hot water heating equipment also provides hot water for manufacturing, industrial or commercial processes which require hot water temperature higher than 105°F. 490.24(a)

☐ **N.** Buildings where domestic hot water is the only source of water available for dishwashing or other purposes which are covered under state or local health regulations prescribing a higher minimum temperature than 105°F. 490.24(b)

☐ **O.** Buildings where domestic water heating/space heating boilers are combined. (This exemption applies only when the space heater is used.) 490.24(c)

☐ **P.** Buildings where solar energy (except for pumps and fans) provides the only source for domestic hot water heating energy. When a non-solar energy source is operating together with solar energy, this exemption does not apply. 490.24(d)

☐ **Q.** Buildings where otherwise wasted energy provides the only source for domestic hot water heating energy. (Applies only at those times when wasted energy is the only source of energy.) 490.24(e)

5. Exemption Justification

For each exemption checked in Section 4 above, attach hereto, and retain for possible inspection, written statements provided to you by tenants claiming exemptions within your building.

6. Specific Exceptions

☐ Check here if a specific exception has been granted by the Department of Energy for the building or any portion of the building.

Name _____ Title _____

Signature _____ Date _____

CS-198

Form Approved
OMB No. 038-S79046

U.S. DEPARTMENT OF ENERGY
BUILDING COMPLIANCE INFORMATION FORM

(Submittal of this Form is *Mandatory* if any Exemptions are Claimed.)

Please Type or Print—See Instructions on Pages 3.

1. Building Owner-Operator-Manager

Name (Last, First, Middle) _____

Building Street Address _____

City _____ State _____ ZIP Code _____

2. Building Size

A. Approximate Gross Floor Area in Thousands of Square Feet ☐☐☐☐☐

B. Number of Stories Heated and/or Air Conditioned ☐☐☐

3. Building Type (Please Check One)

- ☐ A. Industrial/Manufacturing
- ☐ B. School
- ☐ C. Restaurant
- ☐ D. Retail Store (other than retail food store)
- ☐ E. Hospital/Health Care
- ☐ F. Office
- ☐ G. Hotel/Other Lodging
- ☐ H. Shopping Center
- ☐ I. Warehouse
- ☐ J. Retail Food Store
- ☐ K. Combinations of Above (Insert letters) ☐☐☐☐
- ☐ L. Other (please use less than 15 letters) _____

4. Exemptions (If Claimed)

General

- ☐ A. Equipment Warranty
- ☐ B. Processes
- ☐ C. Perishables
- ☐ D. Plant/Animal/Materials
- ☐ E. Health Protection
- ☐ F. Building Structure

System Specific

- ☐ G. No System
- ☐ H. Outside Air
- ☐ I. Waste Energy
- ☐ J. Solar Energy
- ☐ K. Under Capacity
- ☐ L. Certification

Hot Water

- ☐ M. Dual Use
- ☐ N. Dishwashing
- ☐ O. Combined
- ☐ P. Solar Energy
- ☐ Q. Waste Energy

5. Compliance Action Taken

- ☐ A. Full Compliance
- ☐ B. Compliance With Authorized Exemptions
- ☐ C. Exception Requested

6. Year This Building Was Originally Constructed ☐☐☐☐

7. Types of Fuels Used For Heating and Air Conditioning

Space Heating

- ☐ A. Electricity
- ☐ B. Natural Gas
- ☐ C. Fuel Oil
- ☐ D. Coal
- ☐ E. Propane
- ☐ F. Other (specify) _____

Air Conditioning

- ☐ A. Electricity
- ☐ B. Gas
- ☐ C. Other (specify) _____

D. What percentage of this building's gross floor space is air conditioned? ☐☐☐ %

Tear along perforation

Fold One

Fold Two

First Class

Place Stamp Here

Emergency Building Temperature Restrictions
Room GE-004A (CS-39)
Forrestal Building
U.S. Department of Energy
Washington, D.C. 20585

(Staple or tape here)

The letter, and any supporting documents, should be sent to the nearest DOE Regional Office of Hearings and Appeals. The envelope should be labeled: "APPLICATION FOR EXCEPTION—EBTR." Mailing addresses for the five DOE Regional Offices of Hearings and Appeals are:

26 Federal Plaza
New York City, NY 10007

1655 Peachtree Street, N.E.
Atlanta, GA 30309

2626 Mockingbird Lane
Dallas, TX 75235

175 West Jackson Street
Chicago, IL 60604

111 Pine Street
San Francisco, CA 94111

Important Note: *a special exception does not become effective until such time as it is granted by the Department of Energy and the applicant has been notified.*

Part G: Obtaining Further Information

1. Toll-Free Telephone Lines. Information concerning this program and how to comply with its regulations may be obtained by using the toll-free telephone numbers listed below. The lines will be operational between 9:00 A.M. and 5:30 P.M. (Eastern time), Monday through Friday.

Continental U.S.:	800-424-9122
Alaska, Hawaii, Puerto Rico, Virgin Islands:	800-424-9088
Metropolitan Washington, D.C.:	252-4950

2. DOE Regional Offices. Additional program information and materials may be obtained from the following Department of Energy Regional Offices.

Region I 150 Causeway St. Boston, MA 02114 (617) 223-3106	Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont
Region II 26 Federal Plaza New York, NY 10007 (212) 264-8856	New Jersey, New York, Puerto Rico, Virgin Islands
Region III 1421 Cherry St. Philadelphia, PA 19102 (215) 597-3606	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
Region IV 1655 Peachtree St., N.E. Atlanta, GA 30309 (404) 881-2838	Alabama, Canal Zone, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
Region V 175 W. Jackson St. Chicago, IL 60604 (312) 353-1036	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Region VI 2626 W. Mockingbird Lane P.O. Box 35228 Dallas, TX 75235 (214) 767-7777	Arkansas, Oklahoma, Louisiana, New Mexico, Texas
Region VII 324 East 11 St. Kansas City, MO 64106 (816) 374-3815	Iowa, Kansas, Missouri, Nebraska
Region VIII 1075 S. Yukon P.O. Box 26247, Belmar Branch Lakewood, CO 80226 (303) 234-2765	Colorado, Montana, North Dakota, South Dakota, Wyoming, Utah
Region IX 111 Pine St. San Francisco, CA 94111 (415) 556-7148	American Samoa, Arizona, California, Guam, Hawaii, Nevada, Trust Territories of the Pacific
Region X 915 Second Ave. Seattle, WA 98174 (206) 442-7285	Alaska, Idaho, Oregon, Washington

United States
Department of Energy
Washington, D.C. 20585

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APPENDIX B

FACT SHEET

OKLAHOMA LIGHTING ENERGY CONSERVATION ACT

STATE OF OKLAHOMA
OFFICE OF THE GOVERNOR
OKLAHOMA CITY

GEORGE NIGH
GOVERNOR

January 11, 1980

Dear Director:

Events taking place on the national and international scene have re-emphasized the need for a viable energy conservation program for all state agencies. Energy conservation makes sense for both financial and patriotic reasons, and it is the state's responsibility to set an example of wise energy use for the citizens of Oklahoma. The following items deserve special attention and at the same time recognize health and welfare through good judgements.

The Emergency Building Temperature Restrictions Program is currently in effect. This program places temporary restrictions on temperatures for heating, cooling and hot water in most non-residential buildings. The enclosed brochure explains the program and contains the compliance certificate that must be displayed in all state buildings.

Executive Order 79-10 requires all state agencies to appoint an energy conservation officer and develop energy conservation plans to be submitted to the Oklahoma Department of Energy. If your agency has not yet submitted a plan, I urge you to do so as soon as possible. The Oklahoma Department of Energy will also continue to offer seminars on all aspects of energy conservation.

The Executive Order also requires lighting levels be in accordance with State Statute 61, Section 151-157, "and in consideration of health, safety and performance of duties". This statute sets lighting levels based on a watts per square foot approach and applies to all public buildings over 20,000 sq. ft. The intent of the legislation is to realize energy savings through management of lighting while providing sufficient lighting for the task performed. Refer to the enclosed fact sheet for further information.

Building managers and superintendents should in particular be well aware of the regulations and understand the flexibility which is allowed. As you should know there are federal penalties set at as much as $10,000 each for such violations.

I urge each of you to help us in the effort to make state government more energy efficient. If you need more information on any aspect of energy conservation, please contact the Oklahoma Department of Energy, 521-3941.

Thank you for your cooperation.

Sincerely,

George Nigh

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FACT SHEET

"OKLAHOMA LIGHTING ENERGY CONSERVATION ACT"

Oklahoma Department of Energy

Executive Order 79-10 states that lighting levels in state offices be consistent with the provisions of State Statute Title 61, Section 151-157. This Statute provides methods to achieve cost-effective energy reduction, while maintaining good lighting levels. The lighting reductions can generally be performed by existing staff.

Although the state lighting standards require compliance for each building, considerable flexability is allowed on a room-by-room basis within each building. This ensures that lighting reductions are carried out in consideration of health, safety, and performance of duties. Alternatives that may be used to bring a building into compliance include:

- Reduce lighting in seldom - used areas
- Reposition lights to illuminate only those areas where people are working
- Remove unnecessary lamps and ballasts
- Replace existing lamps with reduced wattage, more efficient lamps
- Utilize sunlighting where practical
- Utilize task lighting where practical

In any case, illumination levels should not be adjusted at all if a change may result in lowered productivity, safety or security.

The enclosed form, developed by the Board of Affairs, provides instructions on how to comply with the lighting regulations. Please have your Energy Conservation Officer review the form with your building manager and complete the calculations. You may have received a similar form and already have conducted a lighting survey. If so, please submit a completed copy of that form, or a completed copy of the enclosed form to Alan Holmes at the Oklahoma Department of Energy, 4400 North Lincoln Blvd., Suite 251, Oklahoma City, OK, 405/521-3941.

If you are renting office space in a privately owned building, please bring these standards to the attention of the building owner or manager. Remember, the standards apply only to buildings in excess of 20,000 square feet. By making our lighting more efficient, we will continue to save valuable energy and tax dollars.

In recently adopted State Legislation, lighting standards have been established for any building open to the public exceeding twenty thousand (20,000) square feet of occupied floor space. The legislation prescribes that state government enforce a lighting code to accomplish lighting energy conservation.

HOW DOES THE LIGHTING CODE WORK?

The State legislation establishes lighting power limits for connected loads for new and existing public buildings. The limits are defined in terms of maximum watts per square foot in specific categories. The following limits have been established:

"OKLAHOMA LIGHTING ENERGY CONSERVATION ACT"

LIGHTING LIMITS BY CATEGORY

CATEGORY	MAXIMUM WATTS/SQ. FT.	TYPE OF USE
A	3.00	CLASSROOM OFFICE CLERICAL AREAS OTHERS
B	1.00	AUDITORIUMS WAITING ROOMS STAIRWAYS OTHER
C	0.50	CORRIDORS LOBBIES ELEVATORS OTHERS

If the building cannot meet compliance using the above lighting power limits, an alternate method of determining compliance may be used as defined in the "Code for Energy Conservation in New Building Construction", prepared by the National Conference of States on Building Codes and Standards, Inc.

The lighting code applies only to public buildings exceeding twenty-thousand (20,000) square feet of floor space. Buildings exempt from the lighting code include buildings neither heated nor cooled, residential units, historic buildings, any building whose peak design rate of energy usage for all purposes is less than one watt per square foot of floor area and any building where retrofit actions do not have a four year payback benefit.

The legislation also requires that the building owners prepare and maintain a report on the lighting power budget by January 1, 1980. The report must be available to the Board of Affairs on request. This report must either indicate the building is in compliance or it must define a plan to bring the building into compliance.

WILL ADOPTION OF THE CODE BE DETRIMENTAL TO HEALTH OR PUBLIC SAFETY?

The lighting standards should provide adequate lighting levels to meet public safety and health needs. Lighting power limits apply to the interior lighting needs of a building and do not apply to outside security or public safety lighting. Auxiliary task lighting is not included in the lighting power limit calculation. This means that lighting that is required for special tasks or health reasons is an exception to the lighting power code.

WHO SHOULD CONDUCT THE LIGHTING SURVEY?

The lighting survey should be conducted by the building manager, supervisor, or engineer. Your agency's energy conservation officer should be prepared to assist in this survey.

LIGHTING REGULATIONS
FOR EXISTING BUILDINGS

A. CALCULATION PROCEDURE: To establish the lighting power limit, the following procedure shall be used:

1. Determine the use categories for the various parts of the building from Table 1.

2. Multiply the maximum power limit for each category by the area included in that category.

3. Add the total number of watts for each area to arrive at the total lighting power limit for the building.

4. In open-concept office spaces in excess of 2,000 square feet, with no defined egress or circulation pattern, 25 percent of the area shall be designated as Category B.

5. In rooms with ceilings height in excess of twenty (20) feet, a power allowance, in watts per square foot, of an additional two percent per foot of height is permitted, up to a maximum of twice the limit in Table 1.

EXCEPTIONS

1. Task lighting shall not be included in the lighting power limit calculation.

2. Lighting for, but not limited to, cleanrooms, and theatrical, television, spectator sports and like performances shall not be included in the total building limit. There shall be limited access to the controls for such lighting.

B. ALTERNATES: The lighting power for any interior area may be increased or decreased from the values of Table 1, provided that the total interior lighting power limit calculated in Section A is not exceeded.

C. When lighting power loads exceed the limits of this regulation, the agency shall include with its Lighting Power Audit an implementation plan indicating how and when the building will be brought into compliance. Implementation shall be in accordance with Table 61, Section 151-159, of the Oklahoma Statutes.

INSTRUCTIONS FOR COMPLETING DETAIL AND SUMMARY REPORT FORMS

The Detail sheet is used to record detail information for each use category in your building. Before starting, please make as many copies of this form as you may need to record information for each category.

The Summary sheet is used to record summary information for determining lighting power usage for the whole building.

The following steps should be used to complete these forms:

1. On the Detail sheets, fill in the general identification data on building location, owner, date, etc., as indicated.

2. On the Summary sheet, supply the requested information, and indicate if the building is in compliance with Title 61, Section 151-159

STEPS 3 - 10 (Refer to the Detail Sheets)

The use of the Detail sheet is meant to be flexible. Insert notes clarifying special situations in your audit as needed. The following instructions are suggested as a guide to using the Detail sheet.

3. Fill in the category of use as described in the lighting code. There are three possible categories (A, B, and C) and there should be at least one Detail sheet filled in for each category in your building.

4. ROOM NAME: Fill in a room name for each room in your building.

5. AREA: Fill in the floor area (length x width) for each room.

6. LAMP OR FIXTURE TYPE: From examination of the lamp, fill in the lamp or fixture type in each room. If more than one type is in each room, use a separate line for each type. (See Sample Detail Sheet)

7. QUANTITY: Fill in the number of each lamp or fixture type.

8. WATTS PER UNIT: Fill in the number of watts used by each lamp or fixture. For fixtures with ballasts, this number should include ballast wattage. Combined wattages for both lamps and ballasts are given for typical cases in Table A. (See Sample Detail sheet)

9. TOTAL CONNECTED LOAD: Fill in the total connected load by multiplying the watts per unit times the quantity for each fixture type.

10. On the line called TOTAL at the bottom of the page, enter the total AREA and TOTAL CONNECTED LOAD for the use category. These numbers will be necessary for the Summary sheet.

STEPS 11 - 15 (Refer to Summary Sheet)

11. AREA OF CATEGORY: Fill in the total square footage for each use category (as summarized in the detail sheets) in the appropriate blanks in Section I and II.

12. CONNECTED LOAD (Watts): From the Detail sheets, fill in the total connected load (watts) used for lighting in each category.

13. TOTAL BUILDING LIGHTING BUDGET: Add the total connected loads for each category.

14. TOTAL WATTS FOR EACH CATEGORY: Multiply the area of each category times the Power Limit from Table 1, Watts/sq.ft., provided in Section II.

15. TOTAL BUILDING LIGHTING POWER LIMIT: Add the TOTAL WATTS FOR EACH CATEGORY. If the TOTAL BUILDING LIGHTING POWER BUDGET is less than the TOTAL BUILDING LIGHTING POWER LIMIT, the building is in compliance.

TABLE 1

LIGHTING LIMIT (CONNECTED LOAD)
FOR LISTED OCCUPANCIES: EXISTING BUILDING

MAX. WATTS/SQ. FT.	TYPE OF USE
	INTERIOR
3.00	Category A: Classrooms, office areas, automotive mechanical areas, museums, conference rooms, drafting rooms, clerical areas, laboratories, merchandising areas, kitchens, examining rooms, book stacks, athletic facilities.
1.00	Category B: Auditoriums, waiting areas, spectator areas, restrooms, dining areas, transportation terminals, working corridors in prisons and hospitals, book storage areas, active inventory storage, hospital bedrooms, hotel and motel bedrooms, enclosed shopping mall concourse areas, stairways
0.50	Category C: Corridors, lobbies, elevators, inactive storage areas

Remember, for example, that all classrooms do not have to be less than 3.00 watts/sq.ft. or that all corridors must be less than 0.50 watts/sq.ft. But the total building lighting budget on the following summary form must be equal to or less than the total building lighting power limit.

SUMMARY

LIGHTING POWER AUDIT FORM

HOUSE BILL 1177 (1979)

I. LIGHTING BUDGET (Use Categories from Table 1)

CATEGORY	AREA OF CATEGORY (Sq. Ft.)	CONNECTED LOAD (WATTS)
A		
B		
C		

TOTAL BUILDING LIGHTING BUDGET _____ WATTS

II. LIGHTING POWER LIMIT (Use Categories from Table 1)

CATEGORY	AREA OF CATEGORY (Sq. Ft.)		Power Limit From Table 1 Watts/Sq.Ft.		Total Watts for each Category
A		x	3.00	=	
B		x	1.00	=	
C		x	0.50	=	

TOTAL BUILDING LIGHTING POWER LIMIT _____ WATTS

III. In order to determine compliance, compare Item I with Item II.

IV. Is this building in compliance with House Bill 1177 (1979)?

YES NO

V. If this building is not in compliance with House Bill 1177, attach your implementation plan.

VI. Send a completed copy of this form to the Oklahoma Department of Energy.

OKLAHOMA DEPARTMENT OF ENERGY
LIGHTING POWER AUDIT

DETAIL SHEET

Sheet ___ of ___

GENERAL INFORMATION:

Address: _____
City/Town: _____
Building Owner: _____

CATEGORY OF USE: _____

Room Name	Area (Sq.Ft.)	Lamp or Fixture Type	Quantity	Watts/ Unit	Total Connected Load (Watts)

TABLE A
TYPICAL LIGHTING FIXTURE WATTAGE

I. FLUORESCENT

Lamp Description	Lamps per Fixture / Lamp Type	Fixture Wattage*
4 Ft. 40 Watt Rapid Start	1-F40T12	50
	2-F40T12	92
	3-F40T12	142
	4-F40T12	184
8 Ft. Slimline Instant Start	1-F96T12	100
	2-F96T12	170
	3-F96T12	270
	4-F96T12	340
8 Ft. High Output	1-F96T12/HO	140
	2-F96T12/HO	252
	3-F96T12/HO	392
	4-F96T12/HO	504
8 Ft. 1500 ma Power Grove, SHO or VHO	1-F96PG17 1-F96T12/SHO or VHO	230
	2-F96PG17 2-F96T12/SHO or VHO	450
	3-F96PG17 3-F96T12/SHO or VHO	680
	4-F96PG17 4-F96T12/SHO or VHO	900

II. HIGH INTENSITY DISCHARGE

Lamp Type	Lamp Designation	Watts	Fixture Wattage*
Mercury	MV 100	100	118
	MV 175	175	200
	MV 250	250	285
	MV 400	400	450
	MV 1000	1000	1075
Metal Halide	MH 175	175	210
	MH 250	250	292
	MH 400	400	455
	MH 1000	1000	1070
High Pressure Sodium	HPS 70	70	88
	HPS 100	100	130
	HPS 150	150	188
	HPS 250	250	300
	HPS 400	400	465
	HPS 1000	1000	1090

*Includes Lamp and Ballast Wattage.

OKLAHOMA DEPARTMENT OF ENERGY
LIGHTING POWER AUDIT

SAMPLE

DETAIL SHEET
Sheet 1 of 4

GENERAL INFORMATION:

Address: 300 Main Street
City/Town: Oklahoma City, OK
Building Owner: Tourism and Recreation

CATEGORY OF USE: A

Room Name	Area (Sq.Ft.)	Lamp or Fixture Type	Quantity	Watts/ Unit	Total Connected Load (Watts)
OFFICE	532	2-F40T12	2	92	184
		150R/FL incandescent	4	150	600
CONFERENCE	864	4-F40T12	6	184	1104

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APPENDIX C

HOW TO READ YOUR METERS

This material has been reprinted from Oklahoma State University, Municipal Energy Management Plan for Oklahoma, (Center for Local Government Technology) Stillwater, Oklahoma, 1979.

How to Read Your Meters

It is advisable for you to monitor consumption by reading your own meters.

Electric meters

The purpose of the electric meter is to measure the amount of electricity that a customer uses during a specified billing period. The meter measures electrical energy in kilowatt hours (KWH). A kilowatt hour is the amount of power used times the length of time it is used. For example, if you have ten 100-watt lamps, the power required is 10 x 100 watts = 1000 watts or 1 kilowatt (KW). If the 10 lamps operate for one hour, the meter would indicate one kilowatt hour (1 kilowatt x 1 hour = 1 kilowatt hour) of consumption. You are billed according to the number of KWH's consumed.

Check to see if you have a demand meter. The demand meter records the maximum average rate of power used (kilowatts) for 15 or 30 minute intervals during the billing period. The demand recording device resets itself to "0" every 15 minutes, indicating the maximum demand on the face of the meter. The meter reader resets the demand register to zero every month. Your electrical billing schedule is based on your electrical demand, as indicated by the demand meter. The greater your registered demand, the more you pay for your electrical energy.

How to Read the Meter (From Left to Right)

The KWH dials on the meter are not reset each month. Each dial has ten digits. Each time a dial makes one complete revolution, the pointer on the dial to the left moves ahead one digit. The meter will have either 4 or 5 dials for KWH readings. When the pointer is between numbers, record the smaller number. When the pointer is directly on a number, look at the dial to its right. If that pointer has passed "0", use the next number. If it has not passed "0", use the smaller number.

To calculate consumption in KWH's, subtract the previous reading from the present reading. This figure is multiplied by the meter constant to give the KWH usage. (A meter constant of one is used unless otherwise specified on the meter.)

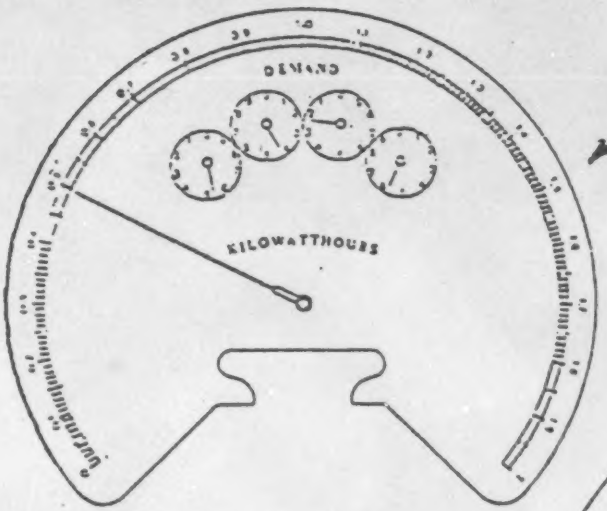
A meter constant larger than one is necessary in some cases due to the physical limitations of the meter. A multiplier must be used to compute actual usage. For example, if a meter has a constant of 80, then each KWH recorded on the meter is equivalent to 80 KWH's consumed.

9 4 8 4

As an example, the four dials above show a present reading of 9484. If the previous reading was 9472, then the difference is 12. If the multiplier for this meter is 80, then the actual quantity of KWH's consumed is 960.

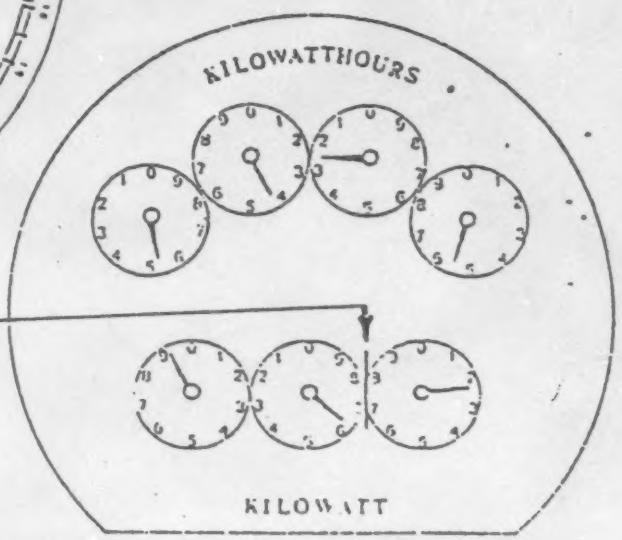
12 X 80 = 960 KWH

There are many different types of demand meters. Three types are illustrated below with their respective readings.



.5 Kilowatts (Demand)

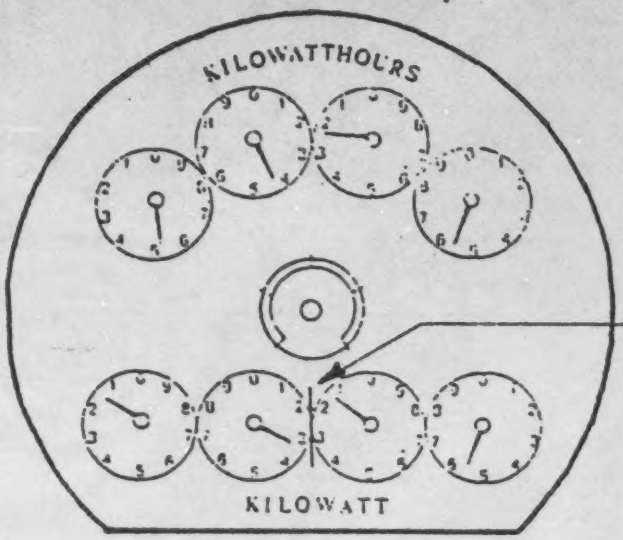
5425 Kilowatt hours (Usage)



96.2 Kilowatts (Demand)

5425 Kilowatt hours (Usage)

(Vertical bar indicates decimal point placement.)



13.15 Kilowatts (Demand)

5425 Kilowatt hours (Usage)

(Vertical bar indicates decimal point placement.)

Now that you understand how to read you electric meter (and have started your energy data collection), it is necessary for you to review some of the factors which affect your electric rates and bill.

1. Basic Rate for Electricity (KWH)

   A. Determined by utility companies -- approved or disapproved by your state's utilities commission.

   B. Customer costs depend on energy usage as measured by meter.

2. Surcharge

   A. Temporary adjustment allowed by your state's utilities commission for interim relief of utility while pending decision on a new rate.

3. Fuel Cost Adjustment

   A. Changes each month

   B. Reflects changing costs of wholesale (gas, coal or oil) fuel used to generate power that are not presently included in the basic rate.

   C. Utility estimates fuel cost adjustment in advance and includes in this month's bill adjustment for error in the past month's estimate.

4, Sales Tax

   A. State sales and use tax plus county sales taxes where applicable.

   B. Identical to sales tax on general purchases.

5. Demand Metering

A. Demand Charge -- The charge to an individual customer for the utility's provision of sufficient capacity to meet the maximum demand of that customer's rate schedule on an "as needed" basis. In principle, this charge should reflect the contribution of the customer's rate schedule to the utility's system peak demand.

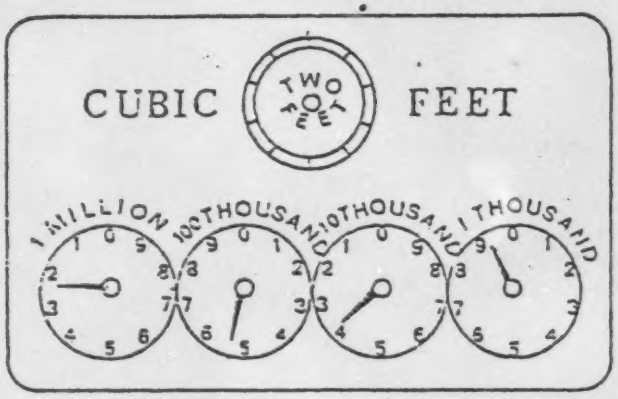
B. Demand Reading -- Highest or maximum demand for electricity an individual customer registers in a given interval, for example, 30 minutes during the month. The metered demand reading sets the demand charge for the month.

C. Demand Ratchet -- If your utility uses a demand ratchet clause in its rate structure, be sure you understand how this affects your utility bills. Call your local utility for further information.

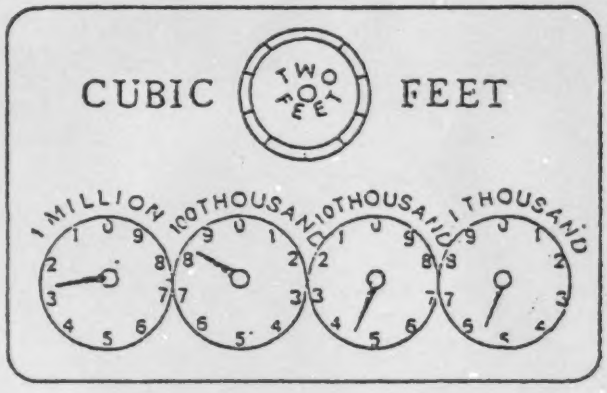
Important: Demand meters should be checked after power outages occur to insure that they have not used their previous readings as a zero point when power is restored. Failure to detect this error will double the demand reading and billing will be in accordance with the new reading.

Gas Meters

Gas meters are read from right to left and the units are usually in thousands of cubic feet of gas consumed. In the illustrations the single dial at the top is used in meter testing and is not "read" by the consumer.



2539 Thousand cubic feet



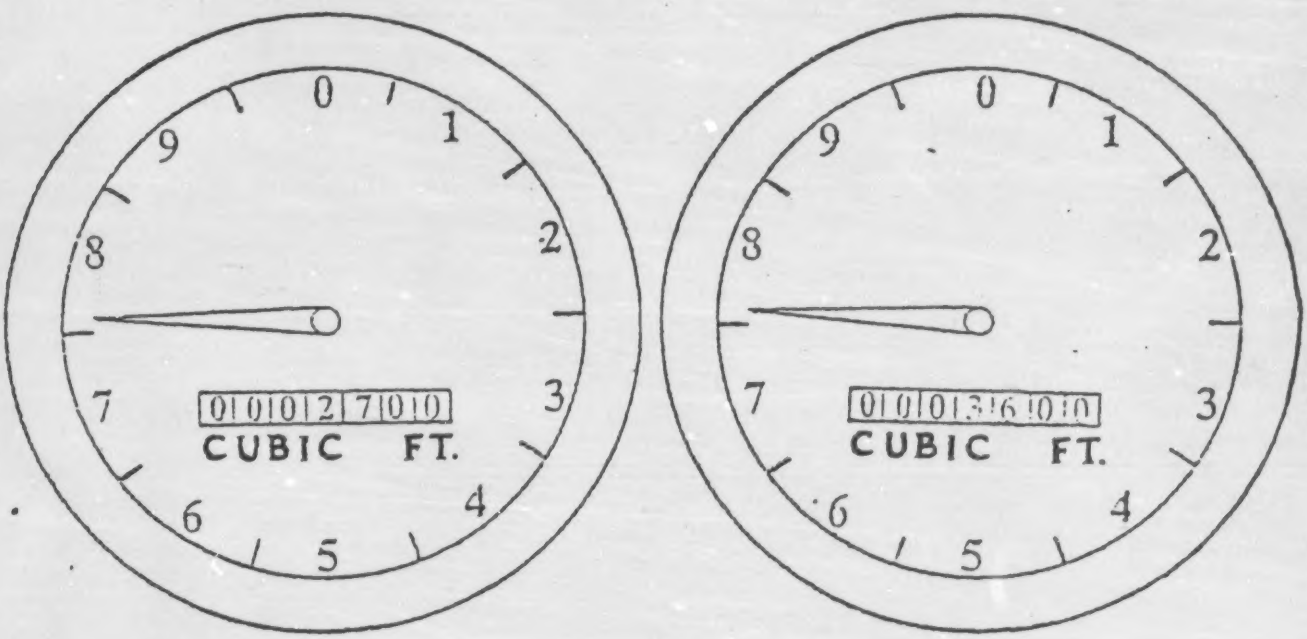
2845 Thousand cubic feet

For the meter on the left, the fourth dial is read as "9", the third as "3". The second dial indicates "5" and the first dial reads "2".

If the second meter represents consumption one month later, subtraction yields gas consumption for the month (2845 - 2539 = 306) in thousands of cubic feet or 306,000 cubic feet.

Water meters

In the illustrations the numbers appearing in the center row of the dials indicate consumption in cubic feet. (Some meters read consumption in cubic feet by 7.5 to obtain the equivalent in gallons.) The pointer and the large dial are used to indicate when water is flowing through the meter, and are not read to measure the quantity of water used. Subtraction of two successive readings yields consumption over the time period.



3600 - 2700 = 900 cubic feet

$$\left(900 \text{ cubic feet} \times \frac{7.5 \text{ gallons}}{1 \text{ cubic foot}} = 6750 \text{ gallons}\right)$$

APPENDIX D

CHECKLIST FOR O&M IMPLEMENTATION

CHECK LIST FOR O & M IMPLEMENTATION

School Name _____

District Name _____

Energy Manager _____

O & M Guidelines	Applicability Yes	Applicability No	Action	Action Date
HEATING				
Reduce heating water temperature	___	___	_____	_____
Reduce direct firing of boilers	___	___	_____	_____
Clean and adjust boiler(s)	___	___	_____	_____
Insulate bare heat piping	___	___	_____	_____
Reduce heat circulation	___	___	_____	_____
VENTILATION				
Close dampers when unoccupied	___	___	_____	_____
Operate ventilation system only as necessary	___	___	_____	_____
Reduce intake of outside air	___	___	_____	_____
Inspect outside air damper mechanism(s)	___	___	_____	_____
Operate exhaust system only as necessary	___	___	_____	_____
Inspect ductwork for air leakage	___	___	_____	_____
AIR CONDITIONING				
Increase chiller water temperature	___	___	_____	_____
Reduce chiller operations	___	___	_____	_____
Cool only occupied areas of building	___	___	_____	_____
Reduce air quantities	___	___	_____	_____

CHECK LIST FOR O & M IMPLEMENTATION

O & M Guidelines	Applicability Yes	Applicability No	Action	Action Date
. Clean filters, coils and fans	___	___	_____	_____
DOMESTIC HOT WATER				
. Lower domestic hot water temperature	___	___	_____	_____
. Insulate tanks and pipes and repair leaks	___	___	_____	_____
. Restrict amount of water being heated	___	___	_____	_____
. Shut down boiler heaters in Summer	___	___	_____	_____
LIGHTING				
. Use lighting only when needed	___	___	_____	_____
. Reduce wattage of lighting	___	___	_____	_____
GENERAL				
. Check time clocks	___	___	_____	_____
. Change thermostat settings	___	___	_____	_____
. Set back thermostats at night	___	___	_____	_____
. Weatherize and seal openings	___	___	_____	_____
. Check automatic controls	___	___	_____	_____
. Keep doors and windows closed	___	___	_____	_____
. Use window shades properly	___	___	_____	_____

ENERGY CONSERVATION GUIDELINES
FOR OPERATIONS AND MAINTENANCE ACTIVITIES

Building Category: Schools

HEATING

1. Reduce the space heating hot water temperature to that which will just satisfy heating needs.

   Maintaining water temperature higher than necessary for heating requires consumption of excess amounts of energy.

   Lowering boiler temperatures while maintaining the same circulation rate will produce greater savings than lowering circulation rates while maintaining the same boiler temperatures. It may be possible on warm spring days to reduce hot water temperatures either manually, or automatically with an outside temperature sensor. Generally, temperatures should be 180°F in mid-winter and 120°F during 60° weather.

2. Reduce direct firing of boilers.

   By cutting back on the number of hours per week the boilers are operated, less heating fuel will be used.

   Examine operating procedures when more than one boiler is involved. It is far better to operate one boiler at 90% capacity than two boilers at 45% capacity each. The more boilers used the greater the heat loss. Lead boilers should be at a maximum loading before lag boilers are put into service. Shut off all boilers in the spring and fall when the air conditioning machine is on and heating control is not needed. Turn off the boiler natural gas standing pilot during the summer months when the boiler is off. Experiment to find the latest start-up time and the earliest shut-down time. Remember the boiler water will remain warm for some time after boilers are cut off. Allow the building to "coast" on this residual heat for the last hour or more of occupancy. On warm days, it may be possible to cut boiler operation by mid or late morning.

3. Clean and adjust boilers.

   Check burner firing period. If it's improper, it could be a sign of faulty controls. Check boiler stack temperature. If it's more than 150°F above steam or water temperature, clean tubes and adjust fuel burner. Check flue gas analysis on a periodic basis.

There should be no carbon monoxide, and carbon dioxide should be present at 9 or 10% for a gas fired unit. Adjust air/fuel ratios of firing equipment. The air to fuel ratio must be maintained properly. If there is insufficient air, the fire will smoke, cause tubes to become covered with soot and carbon, and thus lose heat, wasting energy. Most fuel service companies will test your units free, or charge only a token fee and provide you with specific recommendations.

Inspect boilers for scale deposits (accumulation of sediment or boiler compounds on water-side surfaces). Rear portions of the boiler must be checked because it is the area most susceptible to formation of scale. Scale reduces the efficiency of a boiler and can possibly lead to overheating of a furnace, cracking of tube ends and other problems.

4. Insulate bare heat piping.

Hot water, steam and condensate piping should have an adequate thickness of insulation which is tight and securely wrapped around them. A 160°F bare hot water pipe 1-½" inches in diameter, un-insulated, will lose 13 million Btu/year for each 10' length or approximately $23/yr at typical 1979 natural gas rates.

5. Reduce heat circulation and distribution whenever possible.

Energy can be saved even though a boiler is still firing if circulation is reduced by closing off valves on unused radiators. This causes the boiler firing rate to decrease.

Circulation pumps should be operated only when needed. Controls should be arranged so that areas that are frequently unoccupied can be shut off unless freezing temperatures are expected.

Close radiator valves in unused spaces and in storage areas not requiring freeze protection. Consider closing radiator valves in corridors and lobbies. Heat from classrooms may provide sufficient heat for corridors and lobbies.

6. Close or shut all outside air dampers during unoccupied periods of the heating season.

Low leakage, fully gasketed dampers must be used. The position of the damper should be checked relative to the mechanical or automatic indicator. Make sure that devices such as time clocks, thermostats, etc., which trigger opening and closing of the dampers are working properly.

Close outside air dampers during the first and last hour of occupancy in non-critical areas when the air must be heated or cooled, except when operating an economizer cycle where cool outdoor air is used instead of mechanical refrigeration to meet the cooling load.

7. Operate the ventilation system only as necessary for the comfort of the occupants.

Normally it will only be necessary when the building is occupied. However, in summer when outdoor air temperature at night is lower than indoor temperature, use of full outdoor air ventilation to flush excess heat and pre-cool the structure will reduce air-conditioning load.

8. Reduce intake of outside air.

During cold weather, mixing large volumes of cold outside air with warmer inside air before heating will require twice as much energy than for half the volume of outside air.

If help is available in the form of metering devices or technical advice, reduce outside air drawn into the ventilation system to 7.5 cfm/person in classroom and administrative areas, and 1.5 cfm/square foot in assembly areas, by adjusting outside air intake dampers. Another method to reduce outside air intake is to keep dampers closed normally, and when a room is in use "purge" it periodically by opening dampers fully for a short period of time as odors collect, or if the room seems stuffy. Close off outside air completely in spaces such as storage areas, lobbies, corridors, etc., where exterior doors are continuously opening and closing.

If the unit has an economizer cycle, do not let advice urging reduction of outside air affect the use of this energy saving feature. Whenever possible, use outside air for cooling rather than using mechanical refrigeration.

9. Inspect outside air damper mechanism(s).

Insure that all dampers to the outside air intake or exhaust connection are fully closed when controls indicate and when equipment is shut off. If outside air dampers do not close properly, cold air may leak into the ventilation system, requiring excess amounts of heat energy to bring rooms up to the proper temperature.

Clean and oil damper blades and linkages periodically as necessary to insure their proper operation.

When multiple chiller installations are operating at low loads for most installations, do not put a second chiller on the line until the first one is up to load. Normally less energy is used by one chiller operating at 90% of capacity than by two chillers, each at 45% of capacity.

14. Cool only occupied areas of building.

Special use spaces such as auditoriums, cafeterias, band rooms, large group instruction rooms, and gymnasiums which receive only periodic use should have the air conditioning, ventilating and exhaust systems shut off when these rooms are to be put into service, use all circulated air rather than outdoor air to pre-cool or pre-heat the rooms. Try to schedule use of these rooms so that periods of occupancy are continuous for the portion of the days in which they are occupied. Spotty or unscheduled use would result in more frequent cool down and thus, higher energy use.

15. Reduce air quantities.

Have air distribution system balanced so that each room or air outlet gets the proper amount of air. Adjust fan speed to provide only the proper quantity of air (obtained from design conditions or by trial and error).

If energy conservation suggestions have been implemented which reduce the air conditioning load and thus, the amount of air needed for air conditioning, determine new air quantities and reduce fan speed accordingly.

16. Clean dirty air filters, condenser coils and air delivery fans, annually or more frequently, if necessary, due to dirty outside air.

Keep leaves, dirt and other obstructions from restricting air flow through condenser.

Dirt and other obstructions act as undesirable insulation on heat transfer surfaces such as cooling and condenser coils. Accumulation of dirt on filters and fans can result in more work for fan motors, which results in higher electrical current drains and overloading of motors, thereby shortening their life.

DOMESTIC HOT WATER

17. Maintain lower domestic hot water temperatures.

Reduce generating and storage temperature levels to the minimum required for washing hands, usually 110°F which is the threshold for scalding or dangerously hot water.

Boost hot water temperature locally for kitchens rather than provide higher than necessary temperatures for the entire building.

Maintaining lower domestic hot water temperatures saves energy because less heat is lost through piping and tank walls.

18. Insulate domestic hot water storage tanks and piping and repair all leaks.

Hot water tanks which are uncomfortably hot to touch require extra insulation to prevent heat loss. Hot water lines should have a minimum of ½" insulation securely wrapped and taped. Lines longer than 40 feet should have a minimum of 1" of insulation.

Hot water leaks, including dripping faucets, can be extremely expensive. For example, one leaky faucet may waste from 2500 to 5000 gallons of hot water per year. This is virtually money down the drain!

19. Restrict the amount of domestic water which you are heating.

Remove or turn off domestic hot water to toilet rooms and other spaces that could function without hot water. If hot water is distributed through forced circulation, turn off the pump supplying non-critical areas when they are unoccupied. Consider installing spring activated hot water taps. Consider flow restrictor shower heads in locker rooms and dressing areas. De-energize booster heaters in kitchens at night. In plants with multiple domestic hot water heaters operate only the number of heaters necessary to carry the load. Leave others off for standby.

20. Shut down boiler heaters in Summer.

The use of large boilers such as spare heating boilers for auxilliary production of domestic hot water is extremely inefficient in warm weather when the boilers could otherwise be shut off. If possible, utilize separate gas or electric water heaters or discontinue supply of domestic hot water.

LIGHTING

21. Campaign for better utilization by using letter, memos, signs, and personnel contact to encourage occupants' (especially custodial personnel) to use lighting only when necessary, to use only the amount of lighting required and to turn off lights whenever they are not being used.

Leaving the lights on in a typical classroom for 1 extra unneeded hour per day would result in extra electrical costs of $1.80 per month at typical 1979 prices.

All incandescent lighting should be turned off whenever room is vacant. Fluorescent lighting should be turned off if room is to be vacant as much as 15 minutes. Leave hallway lights off if possible.

Security and parking lights should be timed or on photo electric cells to operate from dusk to dawn only. Adjust timers as daylight hours increase and decrease.

Shut off lights in unoccupied rooms.

22. Reduce wattage total of installed lighting.

Remove unnecessary lamps or fixtures and/or replace present lamps with higher efficiency units. If only lamps are removed, disconnect ballasts since a ballast accounts for 10 to 30% of the lamp's power drain. Reduce area lighting in intense lighting areas such as laboratories and drafting rooms, and substitute task lighting. Check lighting levels with a meter to satisfy minimum requirements and remove up to 50% of the tubes in the fluorescent fixtures in over lighted areas. Use lower wattage bulbs in incandescent fixtures.

In hallways it may be possible to disconnect every other light. In classrooms and administrative areas it may be possible to remove lamps or fixtures but yet maintain the same light level by cleaning lamps and fixture lens or removing the lens entirely.

Use lighter shades of paint on ceilings and walls to improve reflective qualities.

GENERAL

23. Monitor operation of time clocks to ascertain if they are being utilized properly.

Time clocks which are used to turn heating, air conditioning, and/or lighting systems, on and off automatically may be very effective at saving energy. However, if they are set wrong or used improperly they may be automatically wasting energy.

It is important that you experiment with proper start up times to determine the latest possible time to turn heat on in the morning. In an optimun situation your building will recover from night setback temperatures within two hours and be pre-heated to 65°F by the time of arrival of the first occupants. Lighting heat, people heat and use of equipment will help to finish warm-up by the end of the first hour.

However, with the change in seasons the optimum start up time will need to be adjusted so that time clocks must be monitored to prevent coming on too early in warmer months. In like fashion, optimum shut down times during the last hour(s) of occupancy must be determined and periodically adjusted. Also similar results may be obtained with air conditioning and ventilation systems. Above all, time clocks should not be considered fool proof just because they are automatic. In most systems they can be overridden just by flipping a switch, and building operators and managers should not hesitate to do so when building operation does not coincide with pre-programmed time clock settings.

24. Change thermostat settings so that they are in line with overall goals of the energy conservation program.

If your building is like most you can save as much as 8% of your heating fuel bill by lowering the thermostat a mere 5 degrees. If the heating unit has no thermostat, locate a thermometer in the spaces where heating outlets are located and adjust the controls manually. Recommended guidelines are 68°F for classrooms, and administrative areas, 72°F for kindergarten rooms, 65°F for gymnasiums and physical activity spaces. Air conditioning should be set at 78°F. Temperatures of 68°F in winter and 78°F in summer are bordering on uncomfortable for some but not all people. Do not allow a vocal minority to disrupt your energy conservation goals. Instruct all occupants to dress according to the season and consider the use of locking thermostats or thermostat covers. After initial objections to changes in thermostat settings, most people become accustomed to them and become comfortable again. Inform the occupants of the reasons for the changes and let them know the results of the actions. This will pave the way to a smoother transition.

25. Set back thermostats at night.

A 10° heating set back for 8 hours during the night may produce as much as 12% savings during colder months. Air conditioning thermostats should be set higher at night if it is not feasible to use outside air ventilation in lieu of mechanical refrigeration.

If there are no centralized controls, instruct teachers and/or maintenance personnel to see that controls or thermostats are set back upon leaving the building at the end of the day and enforce the program.

26. Weatherize and seal openings.

Weatherizing the building requires a program to limit the amount of infiltrated or exfiltrated air from a building. Savings can generally be substantial for only minor costs.

Replace broken or cracked window panes. Repair and adjust faulty door closers. Caulk, gasket or otherwise weatherstrip all exterior joints, such as those between wall and foundation or wall and roof, and between wall panels. Caulk, gasket or otherwise weatherstrip all openings, such as those provided for entrance of electrical conduit, piping, through-the-wall cooling and heating ducts, air louvers, etc. Caulk around door and window frames on both sides of exterior wall if cracks are evident. Be certain that all operable windows have sealing gaskets and cam latches that are in proper working order. Re-hang misaligned doors. Inspect gasketing on garage or overhead type doors. Repair, replace or install as necessary. Cover all window or through-the-wall cooling units when not in use. Specially designed covers can be obtained at relatively low cost. Make sure that openings for ventilation and exhaust in gyms, auditoriums and large assembly areas are closed when not in operation.

27. Check automatic temperature-control system and related control valves, thermostats and accessory equipment to ensure that they are regulating the system properly.

Check burner firing periods and compressor cycling periods. If they are too frequent or infrequent it could be a sign of faulty controls.

Check thermostats by moving setting from one extreme to the other. Fans should cycle on and off or water or steam should be heard entering the radiator. Pneumatic controls will emit a hissing noise as the thermostat is lowered.

Feel the pipe or the downstream side of steam traps. If it is excessively hot, the trap is probably passing steam. This can be caused by dirt in the trap, excessive steam pressure, or worn trap parts (especially valves and seats). If it is moderately hot - as hot as a water pipe, for example - it probably is passing condensate which it should do. If it's cold, the trap is not working at all. Replace or repair.

Inspect zone shut-off valves. All should operate so steam or heating water going to unoccupied spaces can be shut off.

Calibration of all control instruments should be checked annually and, as operators notice deficiencies they should be corrected immediately.

28. Keep doors and windows closed at all times when the heating or air conditioning units are operating.

If controls are not set properly it will sometimes be necessary for teachers to open a window, "to let in some fresh air." Thermostats responding to the influx of cold air will call for continuous heating and thus compound the problem requiring more windows be opened. Instruct teachers in the proper use of controls and see that heat gets distributed evenly so that certain rooms do not get too hot.

29. Use window shades, blinds, drapes, reflective films, etc., properly to control heat gain and heat loss and help control room temperatures.

During the cooling season shades should be closed to prevent solar heat gain. Reflective films on South and West facing glass are most effective for this purpose.

During the heating season, keep shades closed nights, on cloudy days and at times when the sun is not shining directly on the window. This will prevent heat radiating from people directly to the cold surfaces of the window. Keep the shades open when the sun is shining directly on the window. Solar gains will help offset other heat losses in the building and may make use of lights near the window unnecessary. Instruct faculty and staff in the proper use of shades and see that it is put in practice.

APPENDIX E

FORMS FOR TABULATING AND GRAPHING ENERGY CONSUMPTION

INSTRUCTIONS

MONTHLY CONSUMPTION RECORDS (FIGURES 1-4)

The monthly consumption record is used to record the amount of consumed energy and its cost for each facility or group of buildings metered together. A different form is used for each type of energy used in the system, such as electricity, natural gas, L.P. gas, gasoline, etc.

The forms recommended have a cost per unit column, which is calculated by dividing column one (cost) by column two (consumption). An extra column is provided for notes, check numbers, etc. It should be noted that the cost per unit for the total year is only accurately calculated by dividing the total cost for the year by the total units consumed. Similar forms can be easily constructed for any additional fuel not shown.

In the case of natural gas, note that the units consumed must be inserted in the tables since natural gas could be measured in any of at least three different kinds of units. If it is measured by volume, natural gas is normally either in hundreds of cubic feet (CCF) or thousands of cubic feet (MCF). If it is measured in British Thermal Units (BTUs), it is normally shown in therms. One therm equals 100,000 BTUs.

If consumption of some fuels such as gasoline or propane cannot be determined on a monthly basis, identification on a quarterly basis may be more appropriate. The monthly form may easily be converted to a quarterly form.

Certain general information is recommended at the top of each form. For example, in the case of electricity, there are two items of special interest to energy managers: 1. Is the facility being billed with a demand charge? Some rate schedules show a demand charge, but it is not currently being billed; and 2. Is there a power factor charge? It may also be in the rate schedule, but not be charged.

It is suggested that the information on consumption and cost of energy be transferred to the proper monthly consumption record each time a bill is paid. This procedure will eliminate the search for old bills after they are filed.

Each month the monthly figures in the Monthly Consumption Records should be transferred to the District Monthly Energy Summary (Figure 5). At the end of each fiscal year the yearly totals in the Monthly Consumption Records should be transferred to the Energy Use History Record (Figure 6).

Figure 1

MONTHLY ELECTRICITY CONSUMPTION

YEAR _____

SCHOOL DISTRICT _____

FACILITY _____

METER NUMBER AND LOCATION _____

SCHOOL ACCOUNT NUMBER _____

POWER COMPANY ACCOUNT NUMBER _____

RATE SCHEDULE APPLICABLE _____

IS THERE A DEMAND CHARGE INCLUDED? _____ IS THERE A POWER FACTOR CHARGE? _____

MONTH	KWH COST	KWH CONSUMED	COST/ KWH	
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
TOTAL			→	

COMMENTS: _____

Figure 2

MONTHLY NATURAL GAS CONSUMPTION

YEAR _____

SCHOOL DISTRICT _____

FACILITY _____

METER NUMBER AND LOCATION _____

SCHOOL ACCOUNT NUMBER _____

GAS COMPANY ACCOUNT NUMBER _____

RATE SCHEDULE APPLICABLE _____

CONSUMPTION UNITS:

CCFs, MCFs or Therms

MONTH	COST	(Encirle One)	COST/UNIT	
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
TOTAL		→		

COMMENTS: _____

Figure 3

MONTHLY LIQUEFIED PETROLEUM CONSUMPTION

YEAR _____

SCHOOL DISTRICT _____

FACILITY _____

METER NUMBER AND LOCATION _____

SCHOOL ACCOUNT NUMBER _____

COMPANY ACCOUNT NUMBER _____

MONTH	COST	GALLONS	COST/GALLON	
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
TOTAL			→	

COMMENTS: _____

Figure 4

MONTHLY GASOLINE CONSUMPTION

YEAR _____

SCHOOL DISTRICT _____

FACILITY _____

METER NUMBER AND LOCATION _____

SCHOOL ACCOUNT NUMBER _____

GASOLINE COMPANY ACCOUNT NUMBER _____

MONTH	COST	CONSUMPTION (GALLONS)	COST/GALLON	
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
TOTAL			→	

COMMENTS: _____

INSTRUCTIONS

DISTRICT MONTHLY ENERGY SUMMARY (FIGURE 5)

The District Monthly Energy Summary is a monthly consolidation of energy consumption and cost data for all facilities in the total school district. It will give the superintendent, principals and maintenance chief an up-to-date summary of energy consumed in the system. It will also serve as a monitoring and evaluation source for feedback on conservation efforts being implemented. This data will also be helpful in demand forecasting which requires recent information for accurate projections.

DISTRICT MONTHLY ENERGY SUMMARY

SCHOOL DISTRICT _____ MONTH _____ YEAR _____

FACILITY	ELECTRICITY		NATURAL GAS		L.P. GAS		GASOLINE		OTHER	
	COST	KWH	COST	(UNITS)	COST	GALLONS	COST	GALLONS	COST	(UNITS)
TOTAL										

Figure 5

INSTRUCTIONS

DISTRICT YEARLY ENERGY SUMMARY (FIGURE 6)

A district yearly energy summary record is obtained by combining the corresponding figures from the district monthly summaries (See Figures 1-4).

DISTRICT YEARLY ENERGY SUMMARY

SCHOOL DISTRICT _____ YEAR _____

FACILITY	ELECTRICITY		NATURAL GAS		L.P. GAS		GASOLINE		OTHER	
	COST	KWH	COST	(UNITS)	COST	GALLONS	COST	GALLONS	COST	(UNITS)
TOTAL										

Figure 6

INSTRUCTIONS

ENERGY USE HISTORY (FIGURE 7)

The Energy Use History record is a year-by-year record of energy use for each facility. It is obtained by transferring the total yearly data from the (facility) Monthly Consumption forms. This form could also be used as a consolidation of all energy used in the district by transferring the yearly totals from the District Yearly Energy Summary.

ENERGY USE HISTORY

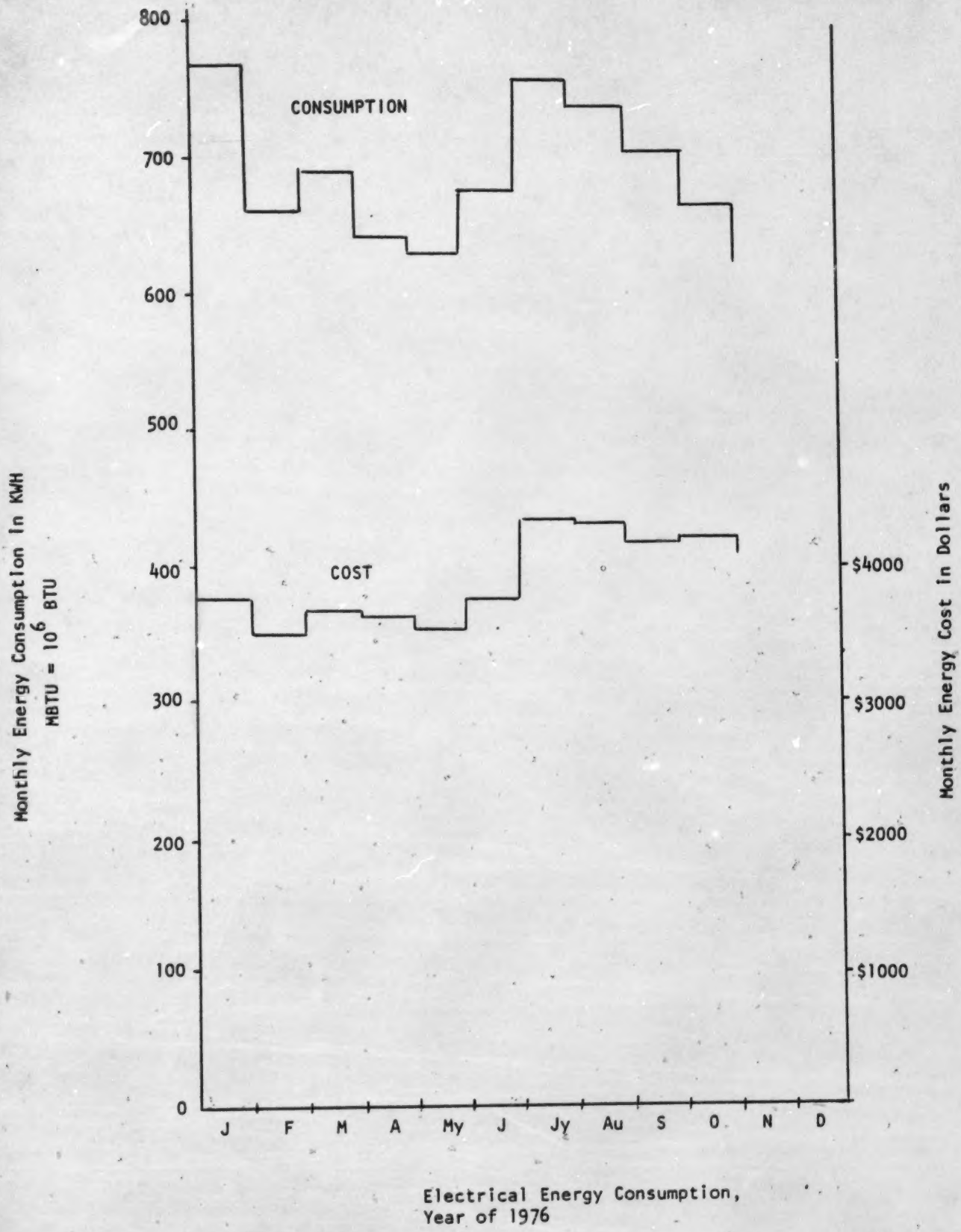
SCHOOL DISTRICT _____ FACILITY _____

	1979-1980		1980-1981		1981-1982		1982-1983	
	COST	KWH	COST	KWH	COST	KWH	COST	KWH
ELECTRICITY								
	COST		COST		COST		COST	
NATURAL GAS								
	COST	GAL	COST	GAL	COST	GAL	COST	GAL
LIQUID PROPANE								
	COST	GAL	COST	GAL	COST	GAL	COST	GAL
GASOLINE								
	COST		COST		COST		COST	
TOTAL COST								

84

Figure 7

Figure 8


800
700
600
500
400
300
200
100
0
CONSUMPTION
COST
Monthly Energy Consumption in KWH
MBTU = 10^6 BTU
$4000
$3000
$2000
$1000
Monthly Energy Cost in Dollars
J
F
M
A
My
J
Jy
Au
S
O
N
D
Electrical Energy Consumption,
Year of 1976

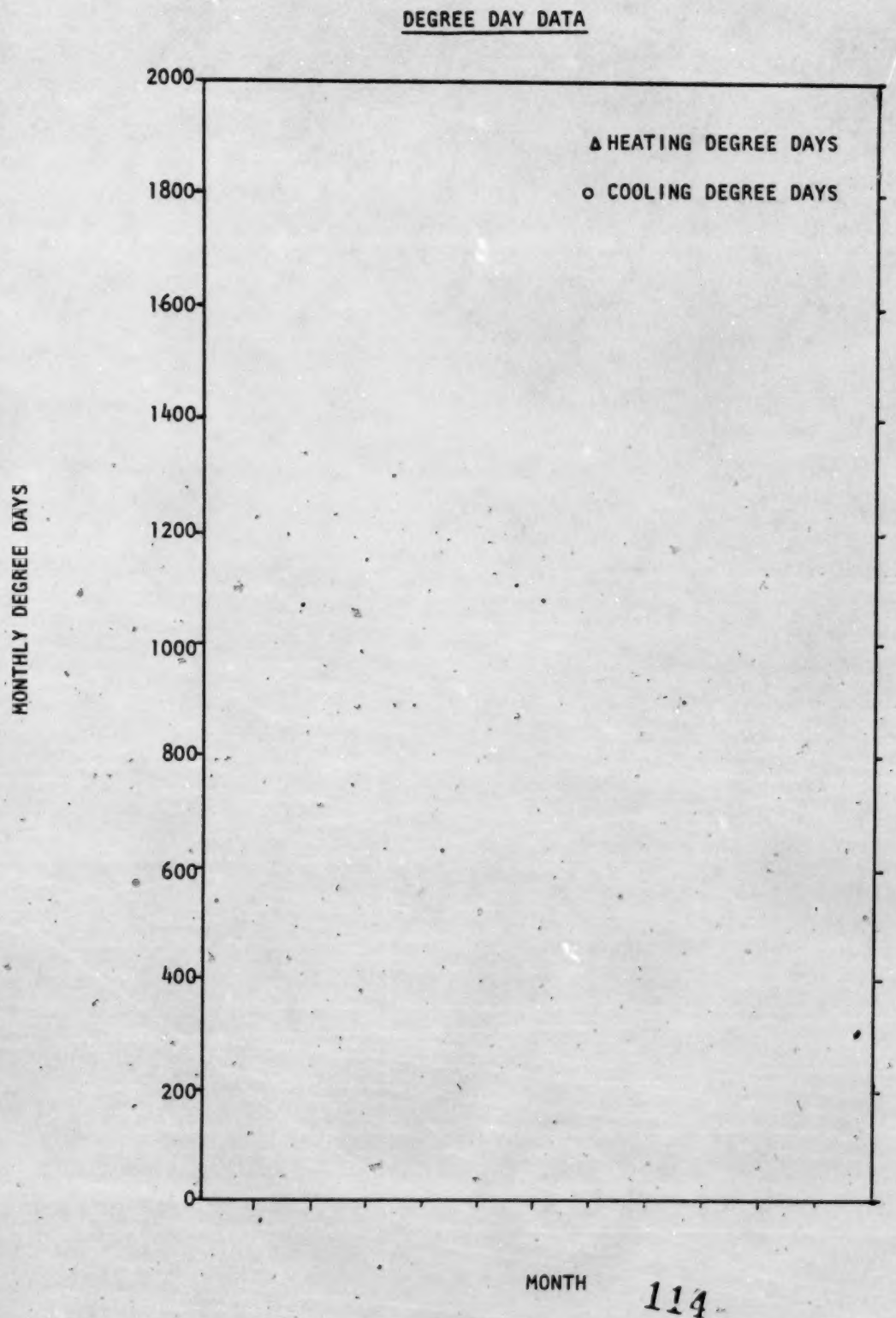
DEGREE DATA AND OTHER FACTORS AFFECTING ENERGY USE

BUILDING _____
AUDIT PERIOD _____
LOCATION OF U. S. WEATHER STATION _____
SOURCE OF WEATHER DATA _____

MONTH	HEATING DEGREE DAYS	COOLING DEGREE DAYS	OPERATING DAYS	BUILDING USE HOURS	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
ANNUAL					
NORMAL DEGREE DAYS					

Figure 9

Figure 10


DEGREE DAY DATA
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Δ HEATING DEGREE DAYS
o COOLING DEGREE DAYS
MONTHLY DEGREE DAYS
MONTH

APPENDIX F

PUBLIC SCHOOLS ENERGY CONSERVATION SERVICE (PSECS)

PUBLIC SCHOOLS ENERGY CONSERVATION SERVICE

FORM PS-42

INSTRUCTIONS

PSECS Form PS-42 is used to describe elementary and secondary schools to the PSECS GAP4 computer program, the latest version in the Guideline Analysis Program (GAP) series. The complexity of each school determines how much of the form is to be used for reporting:

Elementary and middle schools, junior high schools, and other schools in which the only major specialized spaces are an auditorium, gymnasium and/or multipurpose room, should NOT include other special spaces from the list on page 16.

These special spaces are used to describe secondary schools - high schools, junior-senior high schools, K-12 schools, and vocational schools - and other schools with extensive special facilities.

As a general rule it is best to keep the description of the school as simple as possible.

DIVISION OF THE SCHOOL INTO COMPONENT SPACES

Because the parts of a school building use energy in different ways, a school described to the GAP4 program must be divided into component spaces. GAP4 accepts three kinds of component spaces. These are:

1. SPECIAL USE SPACES: spaces in which non-classroom activities take place and which usually have special environmental requirements. Examples of such spaces are auditoriums, gymnasiums and shops. For most elementary schools the only special use spaces are an auditorium, gymnasium, or multipurpose room. A list of additional special use spaces is provided for describing secondary schools.

2. GENERAL AREAS: consist of all spaces in the school which are not itemized as SPECIAL USE SPACES or PORTABLES. In most schools, the bulk of this type of space is made up of classroom or classroom-type spaces (i.e., administrative offices, faculty rooms, etc.).

3. PORTABLES: all portable facilities on the site are grouped into the single category of PORTABLES. While they are described in a manner similar to that used for GENERAL AREAS, they are not part of any GENERAL AREA.

PS-42

GAP4 permits the user to describe facilities built at different times and/or having significantly different plans, construction, environmental systems or patterns of use. This is done by placing each such facility on a separate entry line. For example: if an elementary school has classroom wings built in four phases and possessing different physical characteristics, these might be entered as:

GENERAL AREA A: original building (1926)
GENERAL AREA B: first addition (1952)
GENERAL AREA C: second addition (1965)
GENERAL AREA D: last addition (1974)

The first step in completing these forms is to obtain a small single-line scale drawing of the school and to identify the general areas and special use spaces into which the school is to be divided. A copy of the plan, noting these divisions should be submitted with the completed forms for processing.

GENERAL INSTRUCTIONS FOR COMPLETING FORM PS-42

1. Print clearly in capital letters and enter only one figure per space. Decimal points, commas, periods, etc., each require one space.

2. Do not make stray marks (0,/,-) in blank spaces. If you have no data for a given column, please leave it blank unless otherwise directed.

3. Enter all data in pencil and return the pencil original for processing. Keep a copy.

4. Except where otherwise indicated, all answers are to be right justified; that is, the last digit of the figure is to be inscribed in the rightmost space of the answer blank. This may result in blanks to the left of the figure as the reply space is sized to the largest school anticipated. Do not leave any gaps within the figures as the computer reads these as zero. Where a black dot appears in the upper left corner of an answer blank, figures must be left justified.

5. Except for the unit prices for electricity, fuel, and the figure for per square foot lighting wattage, all figures and codes are whole numbers and do not have decimal points.

6. Read the instruction booklet carefully before filling out the form. If you have any questions, contact EFL.

A

INSTRUCTIONS FOR COMPLETING BOX A

Box A provides general information about the school.

Columns A-1 through A-10 PSECS Use Only

A

Column A-11 — School Name

Beginning in the lefthand space under the dot, enter the name of the school, placing one letter per space. If part of the name is an abbreviation, do not place a period after this abbreviation. Leave a blank space whenever a blank occurs in the name. Left Justify.

Column A-31 — Grades Housed

Beginning in the lefthand space under the dot, enter the grades housed in the school. Use the form "n-n" such as "1-6" or "4-8". Kindergarten is abbreviated with a "K". Other abbreviations such as "SP ED" or "VOC" may be used. Left Justify.

Column A-38 — Total Floor Area

Enter the total enclosed floor area of the school in square feet. Include portables. This number should be the total of all floor areas reported in Box D.

Columns A-45 through A-57 — PSECS Use Only

Column A-58 — Regular Session, Average Daily Attendance

Enter the average daily attendance during the regular school session.

Column A-63 — Regular Session, Class Days

Enter the number of class days in the regular session. For full year programs enter the number of class days in the session beginning in September and ending in May or June. The remaining days should be entered under Summer Session, A-71.

Column A-66 — Summer Session, Average Daily Attendance

Enter the average daily attendance during the summer session.

Column A-71 — Summer Session, Class Days

Enter the number of class days in the summer session. For full year programs enter the number of days of class not reported in Column A-63.

B

INSTRUCTIONS FOR COMPLETING BOX B

Box B provides information on hot water, food service, heated swimming pools and base year energy use.

B

Columns B-1 through B-10 PSECS Use Only

Column B-11 Service Hot Water

Service hot water is the water used for showers, washing hands, etc. Enter the code from the following list that best describes how this water is heated:

Heated by boiler and/or electric heater(s) at least part of the year.....1

Heated by boiler and/or gas heater(s) at least part of the year.....2

Heated by boiler and/or oil heater(s) at least part of the year.....3

Heat exchanger from the boiler is the only source of this water.....4

Column B-12 Kitchen Range Fuel

If there is no meal service at the school, skip to column B-21. If there is meal service, enter the code from the following list that best describes the fuel used in the kitchen ranges:

Electricity.....1

Natural Gas or LPG.....2

Fuel Oil.....3

Column B-13 Daily Full Preparation Meals

Enter the average number of hot meals (including breakfast) fully prepared each day in the school kitchen.

Column B-17 Daily Warm Up Meals

Enter the average number of meals prepared elsewhere which are warmed each day in the school kitchen. Include the number of students purchasing hot snack entrees (hot dogs, hamburgers, etc.)

Column B-21 Swimming Pool Heating

If the school reported does not have a heated swimming pool, skip to Column B-33 on the form. If the school does have one or more heated swimming pools, enter the code that best describes how the pool is heated:

Electric pool heater.....1

Natural gas pool heater.....2

Fuel oil pool heater.....3

Pool is heated by Boiler Group 1.....6
Pool is heated by Boiler Group 2.....7
Pool is heated by Boiler Group 3.....8
Pool is heated by Boiler Group 4.....9

Column B-22 — Swimming Pool Surface Area

Enter the total water surface area in square feet of all heated swimming pools.

Column B-27 — Water Temperature

Enter the water remperature (degrees Fahrenheit) of the pool.

Column B-29 — Days Heated

Enter the number of days during which pool water was heated.

Column B-32 — Swimming Pool Cover

If the heated swimming pool has a cover, enter a "1".

Column B-33 — Base Year Electrical Usage

Enter the total electrical usage in Kilowatt-hours (KWH) during the base year.

Column B-41 — Base Year Peak Electric Demand

Enter the single peak electrical demand recorded during the base year if this figure is available.

Column B-46 — Average Cost/KWH - Base Year

Enter the average cost of electricity per KWH during the Base Year (total cost divided by total amount used). Enter this figure in decimal dollars and cents form, e.g. "three cents" is "0.03". Left Justify.

Column B-51 — Primary Fuel Type

Enter the code that best describes the major fuel used in the school:

*All electric.....10
Natural gas, therms.....21
Natural gas, CCF.....22
Natural gas, MCF.....23
LPG, gallons.....25
No. 2 fuel oil, gallons.....31
No. 4 fuel oil, gallons.....32
No. 5 fuel oil, gallons.....33
No. 6 fuel oil, gallons.....34
Hard coal, tons.....41

B

Soft Coal, tons.....42
Street or purchased steam, MLBS.....51

*In this column only: if the plant is all-electric and all electrical service is on one meter, enter code "10"; if the plant is all-electric and the heating power is metered separately, enter code "11" and enter the non-heating usage in Column B-33 and the heating usage in Column B-53.

Column B-53 — Primary Fuel, Base Year Usage

Enter the primary fuel usage in the units described in Column B-51 for the base year.

Column B-60 — Primary Fuel, Average Unit Cost

Enter the average cost per unit of the primary fuel during the base year in decimal dollars and cents form, e.g. "forty cents" is "0.40". Left Justify.

Column B-65 — Secondary Fuel Type

If there is no secondary fuel, skip the remainder of Box B. If there is a secondary fuel, enter the code from those listed for Column B-51 that best describes this fuel.

Column B-67 — Secondary Fuel, Base Year Usage

Enter the total usage of the secondary fuel in the units described in Column B-51 for the base year.

Column B-74 — Average Cost/Unit - Base Year

Enter the average cost per unit of the secondary fuel during the Base Year in decimal dollars and cents form, e.g. "ten dollars and fifty cents" is "10.50". Left Justify.

Column B-79 — Electrical Rate Schedule

If an electrical rate schedule is to be used instead of an average cost, enter the rate schedule number from PS40, column 9. Enter "0" if the average unit price is to be used.

Column B-80 — Gas Rate Schedule

If a gas rate schedule is to be used, enter the rate schedule number from PS40, column 9. Enter "0" if the average unit price is to be used.

C INSTRUCTIONS FOR COMPLETING BOX C

Box C provides space for describing boilers and chillers as well as special equipment and site lighting (secondary school use).

Boilers and chillers often function together in clusters of two or three, interconnected by controls and piping. Such clusters should be recorded as distinct boiler and chiller groups. They must be designated as separate groups if any of the following conditions is met: they are not interconnected by controls or piping; they are in different parts of the building; they are different kinds of boilers or chillers; they heat or cool different parts of the school; they carry special loads.

The GAP4 computer program attempts to assign energy loads to the boiler or chiller groups which service them. Those spaces coded as being treated by a given boiler or chiller group are linked with the appropriately numbered group in Box C.

There is no hard and fast rule for determining when a boiler or chiller (or group) is "central" or not. Small package units (boilers) serving two or three rooms or less than 15,000 square feet, or twenty-five tons of cooling (chillers) should not be considered as "central" units.

Column C-1 through C-10 — PSECS Use Only

Column C-11 — Central Boiler Type

Enter the code that best describes the type of boiler(s) which make up each central group:

Large boilers, including those with high and low fire

Steam boiler(s).....1
Hot water boiler(s).....2
Steam boiler(s) converting to hot water..3

True modular boilers capable of sectional firing

Modular steam boiler(s).....4
Modular hot water boiler(s).....5

Column C-12 — Number in Group

Enter the number of boilers in each group.

Column C-13 — Input Rating, Lead Boiler

Enter the input rating of the lead boiler - the boiler that is fired most often - as 1000's of Btu/hr, not as Btu/hr. For example: 300,000 Btu/hr = 300 Mbh. If the rating can not be found, leave this column blank and the computer will estimate the rating.

Column C-18 — Primary Fuel

Enter the code that best describes the primary fuel for each boiler group:

C

Electricity.....1
Natural gas, propane or butane.....2
Fuel oil.....3
Coal.....4
Other.....5

Column C-19 Alternate Fuel

If the boiler group can operate on an alternate fuel, enter the code from the above list that best describes this second fuel.

Column C-20 Boiler Group Operation

Enter the code that best describes how each boiler group is operated.

One boiler only in group

Boiler only fired when needed and/or on clock-timer.....1
Boiler fired continuously during load period reported.....3

Two or more boilers in group

Boilers fired only when needed and/or on clock-timers.....1
Lead boiler fired during bulk of reported load period, lag on only as needed.....2
All boilers on fire for bulk of load period.....3

If boiler group is the only source of domestic or service hot water for part or all of the school, enter a "4" in this column.

Column C-21 — Combustion Efficiency

Enter as a percentage, the combustion efficiency of the lead boiler of each group.

Column C-23 — Days Lead Boiler Fired

Enter the number of days (or best estimate) on which the lead boiler was fired during the base year. Count as a day of firing any day on which (a) the boiler was lit and (b) the boiler was hot. Low or partial fire counts as a full day.

Column C-26 — Central Chiller Type

If there are no central chillers in the school, skip to Column C-33. If chillers are present, enter the code that best describes the chillers in each group:

Electric reciprocating.....1
Electric centrifugal.....2
Absorption (gas, steam or hot water).....3
Compressor driven by steam turbine.....4
Compressor driven by natural gas engine.....5

Column C-27 — Number in Group

Enter the number of chillers in each group.

Column C-28 — Cooling Tower

Enter "1" if the group has a cooling tower; "2" if there is an air-cooled compressor. Otherwise leave blank.

Column C-29 — Chiller Fuel

Enter the code that best describes the fuel used (or heat source) in each group:

Electricity.....1
Natural Gas.....2
Fuel Oil.....3

Hot water or steam from Boiler Group 1.....6
Hot water or steam from Boiler Group 2.....7
Hot water or steam from Boiler Group 3.....8
Hot water or steam from Boiler Group 4.....9

Column C-30 — Rated Tons

Enter the total cooling tonnage for the chillers in each group. If the units are rated in BTU, convert to tons by dividing by 12,000.

C

Columns C-33 through C-44 may be used to describe high energy use equipment such as large kilns or forges. Ratings and hours of use MUST be expressed in whole numbers.

Column C-33 — Special Equipment

Using the following fuel codes, enter the type of fuel used by each item of special equipment:

Electricity.....1
Natural gas.....2
Fuel Oil.....3

Column C-34 — Special Equipment Rating

Enter the input rating for each item of special equipment. Electricity should be expressed in KW, gas and oil in KBTU.

Column C-39 — Hours Used, Regular Session

Enter the hours the special equipment was used during the regular (September to June) school session.

Column C-42 — Hours Used, Summer Session

Enter the hours the special equipment was used during the summer session.

Columns C-45 through C-58 may be used to describe secondary school site lighting such as parking, security, athletics, etc. Use whole numbers only.

Column C-45 — Installed KW, Site Lighting

Enter the installed kilowatts (KW) of site lighting by category (parking,security,athletic,other).

Columns C-49, C-52, C-55, C-58 — Hours per Week Use

Enter the number of hours per week for each season that each category of site lighting was used.

ADDITIONS TO CODING FOR NECPA COORDINATION

Questions C-64 through C-80 are included to comply with the latest regulation of Title III of the National Energy Conservation Policy Act (NECPA).

Columns C-64 through C-66, Energy Management Programs

School energy management programs can usefully be divided into three parts, each with a preparation, implementation, and monitoring phase. The three parts of a management program are:

C

Swimming pool heater using renewable energy resources installed.....3
Both applications of renewable energy resources used.....4

Column C-68 Space Heating

Enter the code from Table I that best estimates the percentage of the total building heating load (related to total floor area reported in A-38) provided by renewable energy resources.

Column C-69 Space Cooling

Enter the code from Table I that best estimates the percentage of the total building cooling load (those parts of the total square footage reported as cooled) provided by renewable energy resources.

Columns C-70 through C-71, Site Characteristics

Column C-70 School Site Setting

Enter the code that best describes the general setting of the school. This is not identical with the political location as there may be pockets of "suburban" type areas within major cities and "rural" areas in suburbs.

No answer.....0
Urban setting, e.g. site bordered by multi-story buildings, possible sunshine reduced by dirty air.....1
Suburban setting, e.g. site bordered by detached houses,, little air degradation.....2
Rural setting, e.g. site surrounded by open land, air relatively clean.....3

Column C-71 Available Open Land

Enter the code that best describes the availability of unshaded open land, or land which could be made unshaded by removing vegetation, adjacent to the school building. This land should be a minimum of about one-half acre in extent.

No answer.....0
No such land available.....1
Land available in use as playfields.....2
Land available in use as parking lot.....3
Land available in use as school lawn.....4
Land available not presently used or low priority use readily changed.....5

Columns 72-74, Additional Roof Characteristics

Column C-72 Pitch and Facing

Enter the code from Table I that best estimates the percentage

of the total roof area that is:

a) sloped at greater than one foot rise in two foot run (approximately 30 degrees) AND

b) faces between southeast and southwest (a line perpendicular to the roof ridge-line points between these two directions).

Column C-73 Total Roof Shading

Enter the code from Table I that best estimates the percentage of the total building roof area that is shaded for more than four hours per day.

Column C-74 Roof Obstructions

Enter the code from Table II that best describes whether or not there are obstructions on the roof of the school which would interfere with the installation of solar collectors.

Columns 75-78 Additional Wall Characteristics

Column C-75 South Facing Wall

Enter the code from the list in Appendix 2 that best describes the construction and insulation of the solid portions of the south-facing walls. If more than one code applies, enter the code describing the predominant type.

Column C-77 South Facing Glass

Enter the code from Table I that best describes the percentage of building glass in the south facing wall(s) of the building.

Column C-78 Architectural Shading

Enter the code from Table I that best estimates the percentage of the southward facing glass (reported in C-77) that is shaded by architectural devices, such as sunscreens, overhangs, etc.

Column C-79 Total Wall Shading

Enter the code from Table I that best estimates the percentage of the southward facing wall area that is shaded for more than four hours per day by other buildings and/or obstructions, trees and other vegetation.

C

Column C-80 Mechanical Plant Location

Enter the code from the following list that best describes the location of the mechanical plant of the school. Include in this consideration only central boilers and chillers reported in BOX C.

No answer.....0
No qualifying systems.....1
Equipment not on site.....2
Equipment mostly housed in basement mechanical room(s)...3
Equipment mostly housed in ground floor mechanical room(s).....4
Equipment mostly housed in upper floor mechanical room(s).....5
Equipment housed largely on roof.....6

TABLE I

PERCENTILE CODES

No answer, information not available.....0
0 per cent no described use.....1
1 to 10 per cent usage.....2
11 to 25 per cent usage.....3
26 to 50 per cent usage.....4
51 to 75 per cent usage.....5
76 to 100 per cent usage.....6

TABLE II

YES/NO CODES

No answer, information not availeble.....0
Yes.....1
No.....2

D

INSTRUCTIONS FOR COMPLETING BOX D

Box D provides for the description of the component spaces of the school. Component spaces are divided into three categories:

1. SPECIAL USE SPACES
2. GENERAL AREAS
3. PORTABLES

Additional discussion of these spaces types can be found on pages 1 and 2.

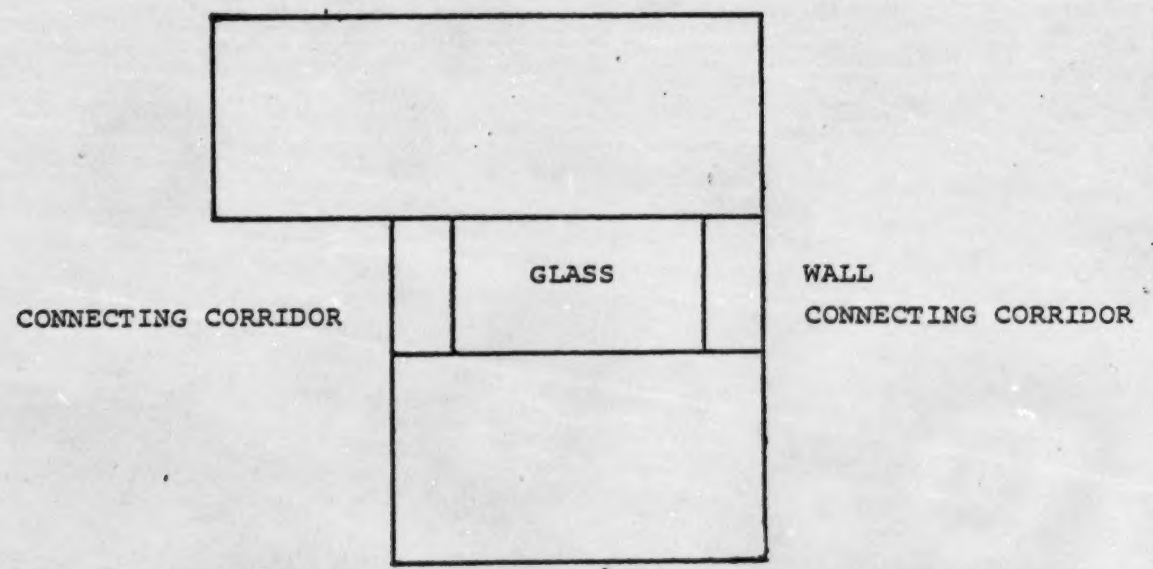
Form PS-42 allows the user to identify and describe a number of SPECIAL USE SPACES in addition to entries for several GENERAL AREAS and PORTABLES. A listing containing all current candidate spaces is provided with each PS-42 form. The user is cautioned to make the simplest possible description of the school while making sure that spatial differences are adequately described.

GAP4 classifies spaces according to patterns of energy use. this classification system recognizes eight major space types:

1. Large assembly spaces (codes 11-20)
2. Gymnasium type spaces (codes 21-29)
3. Swimming pool enclosures (code 30)
4. Shower/locker rooms (codes 31-40)
5. Shop type spaces (codes 41-59)
6. Kitchens (code 60)
7. Large academic type spaces (codes 61-70)
8. Classroom, circulation and supporting spaces (codes 81-89)

Within each major space type, finer distinctions in energy use patterns can be identified. These are reported to the GAP program as subdivisions of the major space type, e.g., Girl's Gymnasium, Wood Shop. One broad descriptive term such as "Shops" is provided for each space type. If all shop-type spaces in a school were built at the same time, have the same systems and are used in much the same way, the entire group may be reported as "Shops." If, however, one shop is used on a different schedule, this shop should be reported separately.

A special line coded "80" may be used if the school has environmentally treated glass-walled corridors connecting buildings or parts of buildings. Such corridors might be characterized as glass tubes or tunnels. If the corridors are not treated, they may be regarded as "unenclosed" area, and need not be recorded on the forms.



D

Columns D-1 through D-7 — Special Space Name

Write the name of each space reported as an entry in the blank area under Columns D-1 through D-7 on the form. (PS-42 only)

Column D-8 — Space Type Code

If you are describing a secondary school, enter the code from the list provided that describes the space being entered.

CODES FOR SPACE TYPES

11	Auditorium	50	Greenhouse
12	Theater	-	
13	Large Commons	59	Bus Garage/Storage
14	Large Group Instruction		
15	Multi-purpose	60	Kitchen
		61	Cafeteria
21	Gymnasium	62	Administrative A
22	Girl's Gymnasium	63	Administrative B
23	Boy's Gymnasium	64	Administrative C
24	Auxiliary Gymnasium	65	Library/Media Center
25	Small gymnasium	66	Music Room
26	Field House	67	Computer Room
30	Pool Enclosure	80	Connecting Corridor
31	Shower/Locker	81	General Area 1
32	Girl's Shower/Locker	82	General Area 2
33	Boy's Shower/Locker	83	General Area 3
34	Pool Shower/Locker	84	General Area 4
35	Team Shower/Locker	-	
		89	Portables
41	Shops		
42	General Shop		
43	Auto Shop		
44	Wood Shop		
45	Metal Shop		
46	Agriculture Shop		
47	Print Shop		
48	Machine Shop		
49	Construction Shop		

Column D-11 — Year Opened

Enter the last two digits of the year the space was opened for the first time. If prior,to 1900, enter "00".

Column D-13 — Plan Type

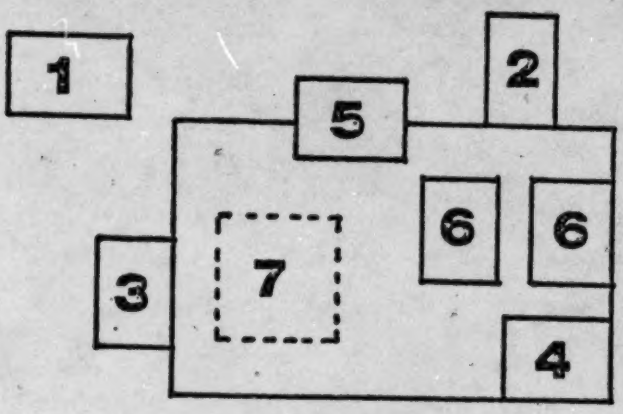
Enter the code that best describes the plan configuration of the space from one of the following lists.

If the space is a SPECIAL USE SPACE:

Freestanding.....1
Attached to another space by short side..2

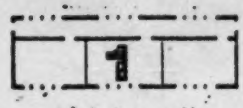
D

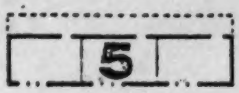
Attached to another space by long side...3
Attached to another space by two sides...4
Partially enclosed.....5
Attached by three sides or fully enclosed.....6
Space in basement, no outside walls.....7

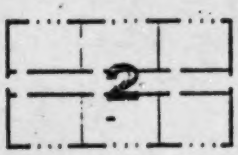


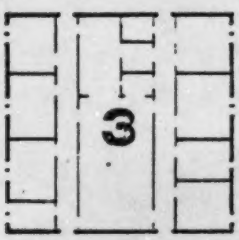
If the space is a GENERAL AREA or PORTABLE:

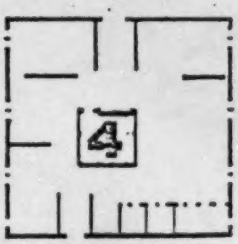
Single-loaded with enclosed corridor.....1
Double-loaded corridor.....2
Compact plan (has interior rooms).....3
Compact plan with courtyard (s) 4
Single-loaded with open corridor.....5
Back to back with open corridors.....6











Column D-14 — Exterior Classrooms

Skip this column for SPECIAL USE SPACES.
For GENERAL AREAS and PORTABLES, enter the number of classrooms and classroom equivalents with an exterior exposure (at least one outside wall).

Column D-16 — Number of Buildings

Skip this column for SPECIAL USE SPACES.
For GENERAL AREAS and PORTABLES, enter the number of buildings in each GENERAL AREA or PORTABLE. If the number is greater than nine, use an additional entry line for the remaining buildings, and code the rest of the line identically to the first.

Column D-17 — Floor Area

Enter the floor area of each space making sure to record each space only once. The sum of the areas reported in Column D-17 should equal the total floor area reported in Column A-38.

Column D-23 — Roof Area

Enter the roof area of each space. Do not include overhangs or covered walkways. If the space is beneath other treated spaces and has no exposed roof, leave this column blank.

Column D-29 — Skylight Area

Enter the area of all skylights in the space. NOTE: the reported roof area, Column D-23, includes the area of skylights.

Column D-33 — Roof Code

Enter the code from the list in Appendix 1 that best describes the construction and insulation of the roof.

Column D-35 — Wall Code

Enter the code from the list in Appendix 2 that best describes the construction and insulation of the solid portion of the exterior walls.

Columns D-37 through D-52

For GENERAL AREAS and PORTABLES these columns describe a TYPICAL (or representative) CLASSROOM or classroom equivalent. Enter data for a single classroom unit only; not for the entire space. For SPECIAL USE SPACES the descriptions apply to the space as a whole.

Column D-37 — Number of Exterior Doors

Enter the number of doors opening directly to the outdoors in a TYPICAL CLASSROOM.

D

Column D-38 — Lighting Watts per Square Foot

Enter the watts per square foot of installed lighting in each SPECIAL USE SPACE or TYPICAL CLASSROOM. This is calculated by dividing the total wattage of all lamps in the space by the floor area. For fluorescent and mercury vapor lights, do not include an allowance for ballasts. Enter in decimal form, such as "1.5" or "2.0".

Column D-41 — Lighting Type

Enter the code that best describes the predominant type of lighting in the space:

Incandescent.....1
Fluorescent.....2
Mercury vapor or other HID.....3

Column D-42 — Window Area: Double-glass or glass-block

Enter the square foot area of double-glass and/or glass-block in the space.

Column D-45 — Window Area: Single or float-glass

Enter the square foot area of single-sheet glass in the space.

Column D-49 — Window Condition

Enter the code that best describes the condition of the windows:

Tight fitting, little air leakage.....1
Medium fitting, some air leakage.....2
Loose fitting, considerable air leakage.....3

Column D-50 — Daytime Temperature

For each space enter the daytime setting of the thermostat during the heating season.

Column D-52 — Nighttime Temperature

If the heating system operates at night to maintain a given temperature, enter that temperature for each space. If the system is not operated at night or is operated only to protect against freezing, leave this column blank.

Columns D-54 through D-62 — Mechanical Systems

Describe the mechanical system of each SPECIAL SPACE, GENERAL AREA or PORTABLE. In reporting these systems, it may be necessary to ignore some elements of the system such as radiators at outside doors and occasional small room fans. GAP4 provides for exhaust fans for closets, laboratories and toilet rooms so these need not be considered.

Column D-54 — Non-Outside Air Heating

If the space has a heating system that does not provide outside air (see list below) enter the code that best describes this system. If the area does not have such a system, skip to D-56. If the space has both outside air and non-outside air systems enter data here and at D-56.

Radiators, radiant panels and/or supplementary perimeter system.....1
Unit heater(s), fan coil unit(s).....2
Furnace(s).....3
Residential type heat pump(s).....6

Column D-55 — Source of Heat

Enter the code that best describes the source of heat for the non-outside air heating system:

Hot water or steam from Boiler Group 1.....1
Hot water or steam from Boiler Group 2.....2
Hot water or steam from Boiler Group 3.....8
Hot water or steam from Boiler Group 4.....9
Electric coils.....3
Direct-fired gas unit.....4
Direct-fired oil unit.....5
Small packaged boilers (less than 250 Mbh)...7

Column D-56 — Outside Air System, Supply

Enter the code that best describes the manner in which outside or fresh air is introduced into each area:

Through window(s) only.....blank
Transfer air from another area.....1
Large fans located in central fan rooms, "house fans".....2
Unit ventilator(s).....4
Single-duct or single-zone systems.....5
Heat pump systems.....6
Multizone or dual-duct systems.....7
Variable air volume systems.....8

House fan systems (code "2") are typically found in schools built prior to World War II and have fixed outside air volumes.

Column D-57 — Outside Air System, Exhaust

Enter the code that describes how room air is exhausted from the area.

Through windows only.....blank
Gravity Relief.....1
Dampered Gravity Relief.....2
Powered exhaust fans (not including closet or toilet room exhausts).....3
Transfer of air to another area.....4

D

Return to air-supply system
through ducts.....5
through a ceiling plenum.....6

Column D-58 Source of Heat

If the air in the supply system (see Column D-56) is not heated, or if the heating in this system is rarely used, leave this column blank. If there is heating enter the code from the list for Column D-55 that best describes the source of this heat.

Column D-59 Percent Cooled

Enter the percentage category of the floor area that is cooled by the air supply system:

0 to 10 percent.....blank
11 to 25 percent.....1
26 to 50 percent.....2
51 to 75 percent.....3
76 to 100 percent.....4

Column D-60 Source of Cooling

If the air supply system, or any part of it is capable of providing cooled air, enter the code that best describes the method by which air is cooled:

Direct expansion (DX) coils.....1
Chilled water or glycol
from Chiller Group 1.....2
from Chiller Group 2.....3
from Chiller Group 3.....8
from Chiller Group 4.....9
Evaporative or swamp cooler(s).....5
Heat pump(s).....6

Column D-61 Reheat

If after initial cooling of the air-stream, a portion of the supply air is heated again ("reheat") before delivery to the space, enter the code that best describes how this reheating is accomplished:

Steam from a boiler(s).....1
Hot water from a boiler(s).....2
Electric coils.....3
Coils using refrigerant gas.....4

Column D-62 Number of Air Supply Units

If an air-supply system, other than windows or transfer air is reported in Column D-56, enter the number of air supply units serving the area.

Columns D-64 through D-80 — Scheduling Information

Describe the school's educational program schedule in these columns. Utilization for a typical day falls into two distinct categories: 1) Regular or day session use (all use prior to approximately 6 p.m.) 2) Evening use, (all use after approximately 6 p.m.).

MONDAY-FRIDAY

Regular Session (September to June)

Column D-64 — **Days per Week**

Enter the number of days per week (Mon.-Fri.) that the space is normally used.

Column D-65 — **Hours per Day**

Enter the number of hours the space is used during the normal school day.

Summer Session (June to September)

Column D-67 — **Days Used**

Enter the number of week days each space is used during the summer session.

Column D-69 — **Days per Week**

Enter the number of days per week (Mon.-Fri.) that the space is used.

Column D-70 — **Hours per Day**

Enter the number of hours per day (Mon.-Fri.) each space is used.

Column D-71 — **Percent Quartile Used**

Enter the code that best describes the portion of the GENERAL AREA or PORTABLES used during this period:

1 to 25 percent.....1
26 to 50 percent.....2
51 to 75 percent.....3
76 to 100 percent.....4

SATURDAY-SUNDAY

Column D-72 — **Days per Year**

Enter the number of weekend days that each space is used .

Column D-74 — **Hours per Day**

Enter the number of hours each space is used on a typical weekend day.

D

Column D-75 — Percent Quartile Used

Enter the code that best describes the portion of the GENERAL AREA or PORTABLES used during this period:

1 to 25 percent.....1
26 to 50 percent.....2
51 to 75 percent.....3
76 to 100 percent.....4

EVENINGS

Column D-76 — Nights per Year

Enter the number of evenings each space is used.

Column D-79 — Hours per Evening

Enter the number of hours each area is used on a typical evening.

Column D-80 — Percent Quartile Used

Enter the code that best describes the portion of each GENERAL AREA or PORTABLE used each evening:

1 to 25 percent.....1
26 to 50 percent.....2
51 to 75 percent.....3
76 to 100 percent.....4

APPENDICES

ROOF AND WALL CODES

In Column D-33 and Column D-35 the respondent is asked to describe the roof and wall of given portions of the school, using the codes in the following lists. These codes describe the basic construction of the roof or wall and whether or not additional materials have been added to this basic fabric for energy conservation or other purposes.

In using these lists, first select the general nature of the element, such as a SOLID BRICK wall; then go through the list and select the best and most complete description of the element.

APPENDIX 1

Column D-33 — ROOF CODES

Enter the code that best describes the roof type for a given space.

Roof	Code
CONCRETE DECKING	
Lightweight concrete, roofing, form board	61
with no suspended ceiling	61
and 1" of insulation	67
and 2" of insulation	68
and vermiculite fill	68
and 3" of insulation	69
with a suspended ceiling	62
and 1" of insulation	64
and 2" of insulation	65
and vermiculite fill	65
and 3" of insulation	66
Heavyweight concrete, roofing, form board	71
with no suspended ceiling	71
and 1" of insulation	77
and 2" of insulation	78
and vermiculite fill	78
and 3" of insulation	79
with a suspended ceiling	72
and 1" of insulation	74
and 2" of insulation	75
and vermiculite fill	75
and 3" of insulation	76

(Note: Most concrete, especially that used in pre-World War II buildings, is heavyweight concrete)

ROOF CODES (continued)

METAL DECKING

with roofing	51
and no suspended ceiling	51
and 1" of insulation	57
and 2" of insulation	58
and vermiculite fill	58
and 3" of insulation	59
and a suspended ceiling	52
and batt insulation	53
and 1" of insulation	54
and 2" of insulation	55
and vermiculite fill	55
and 3" of insulation	56

MINERAL FIBER DECKING (e.g. Tectum) and roofing

	2" tectum	3" tectum
and no suspended ceiling	31	41
and 1" of insulation	37	47
and 2" of insulation	38	48
and vermiculite fill	38	48
and 3" of insulation	39	49
and a suspended ceiling	32	42
and batt insulation	33	43
and 1" of insulation	34	44
and 2" of inuslation	35	45
and vermiculite fill	35	45
and 3" of insulation	36	46

WOOD DECKING	1" wood	2" wood
decking with roofing		
and no suspended ceiling	11	21
and 1" of insulation	17	27
and 2" of insulation	18	28
and 3" of insulation	19	29
and a suspended ceiling	12	22
and batt insulation	13	23
and 1" of insulation	14	24
and 2" of insulation	15	25
and 3" of insulation	16	26

Portable	
without insulation	12
with insulation	13

PITCHED ROOF WITH ATTIC

Asphalt shingles	96
with inside sheathing	92
and 2-1/2" batts	93
and 3-1/2" batts	94
Clay tile - use above figures	

APPENDIX 2

Column D-35 — WALL CODES

Select the code that best describes the wall type for a given space.

Wall	Code
CONCRETE BLOCK	
8" block	31
filled with vermiculite	32
with 1" insulation	33
with 2" insulation	34
12" block	35
filled with vermiculite	36
with 1" insulation	37
with 2" insulation	38
SOLID BRICK	
8" thick, no cavity, plaster	11
with lath and plaster	12
with insulating board and plaster	13
12" thick, no cavity, plaster	15
with lath and plaster	16
with insulating board and plaster	17
BRICK ON CONCRETE BLOCK	
8" thick, no cavity	21
with cavity (1" air space)	22
and insulating board	23
block vermiculite filled	24
4" block, no cavity	25
with cavity (1" air space)	26
and insulating board	27
block vermiculite filled	28
BRICK VENEER ON WOOD OR STEEL STUD WALL	41
with R=7 batts included	42
with R=9 batts included	43
WOOD SIDING ON WOOD OR STEEL STUDS	51
with R=7 batts included	52
with R=9 batts included	53
STUCCO ON WOOD OR STEEL STUDS	54
with R=7 batts included	55
with R=9 batts included	56

WALL CODES (Continued)

CURTAIN WALL, STOREFRONT OR INSULATED PANELS

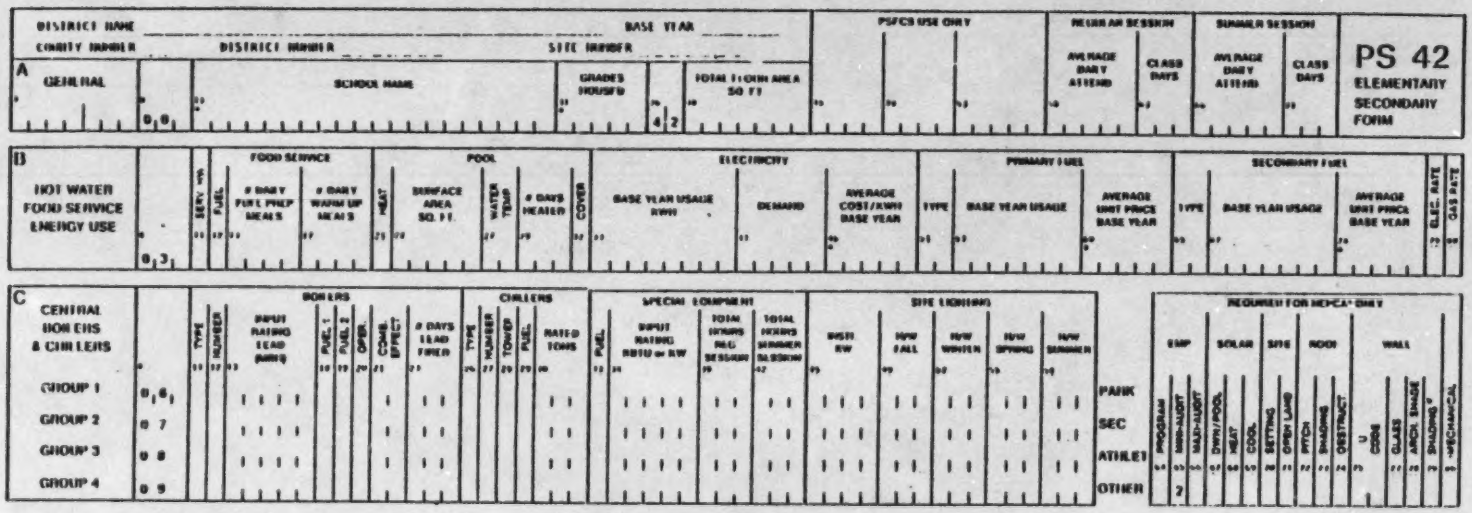
with no insulation	57
with 1" insulation	58
with 2" insulation	59

PORTABLES

without insulation	57
with insulation	58

CONCRETE WALL

4" or 6" thick, no insulation	61
with 1" insulation	62
with 2" insulation	63
8" thick, no insulation	65
with 1" insulation	66
with 2" insulation	67



PSECS PUBLIC SCHOOLS ENERGY CONSERVATION SERVICE

PLEASE REFER TO THE INSTRUCTION MANUAL BEFORE STARTING WORK ON THIS FORM

If you have questions contact:
SCHOOL PLANT SERVICES - Rm. 321
State Department of Education
2500 N. Lincoln Blvd.
Oklahoma City, OK 73105
(405) 521-3811

BOX B

COL 11 SERVICE HOT WATER
Boiler another plan has, but domestic 1
Boiler another type, but domestic 2
Boiler another and but electric 3
Boiler only source 4

COL 12 FUELS
Electricity 1
Natural gas 2
Oil 3
Coal 4
Wood chips 5

COL 21 POOL HEATING
Electric heat pump/boiler 1
Natural gas heat/boiler 2
Oil heat/boiler 3
My Boiler Group 1 6
My Boiler Group 2 7
My Boiler Group 3 8
My Boiler Group 4 9

COL 22 POOL COVER
Blank 0
Cover 1

COL 31, 45 FUEL TYPE
All electric 00
Natural gas, Electric 21
Natural gas, ECE 22
Natural gas, MCE 23
LPG, gallons 25
No. 2 fuel Oil, gallons 31
No. 4 fuel Oil, gallons 32
No. 5 fuel Oil, gallons 33
No. 6 fuel Oil, gallons 34
Wood / coal, tons 41
Solid Fuel, tons 42
Solar Steam, BTUS 51

COL 79 DISC. RATE
Use percentages 0
Use Schedule 1, 2, 3 or 4

COL 80 GAS RATE
Use percentages 0
Use Schedule 5, 6, 7 or 8

BOX C

COL 11 BOILER TYPE
Steam 1
Hot water 2
Furnace boiler consuming by fuel source 3
Modular steam 4
Modular hot water 5

COL 18, 19, 20, 21 FUELS
(Same files 0127 for fuel codes)

COL 30 BOILER OPERATION
Boilers turned only as needed 1
Fossil run, fuel as needed 2
All run time during heat period 3

COL 10 CHILLER TYPE
Electric centrifugal 1
Electric reciprocal 2
Absorption 3
Steam turbine 4
Gas engine 5

COL 20 COOLING TOWER
Cooling tower 1
Air cooled 2

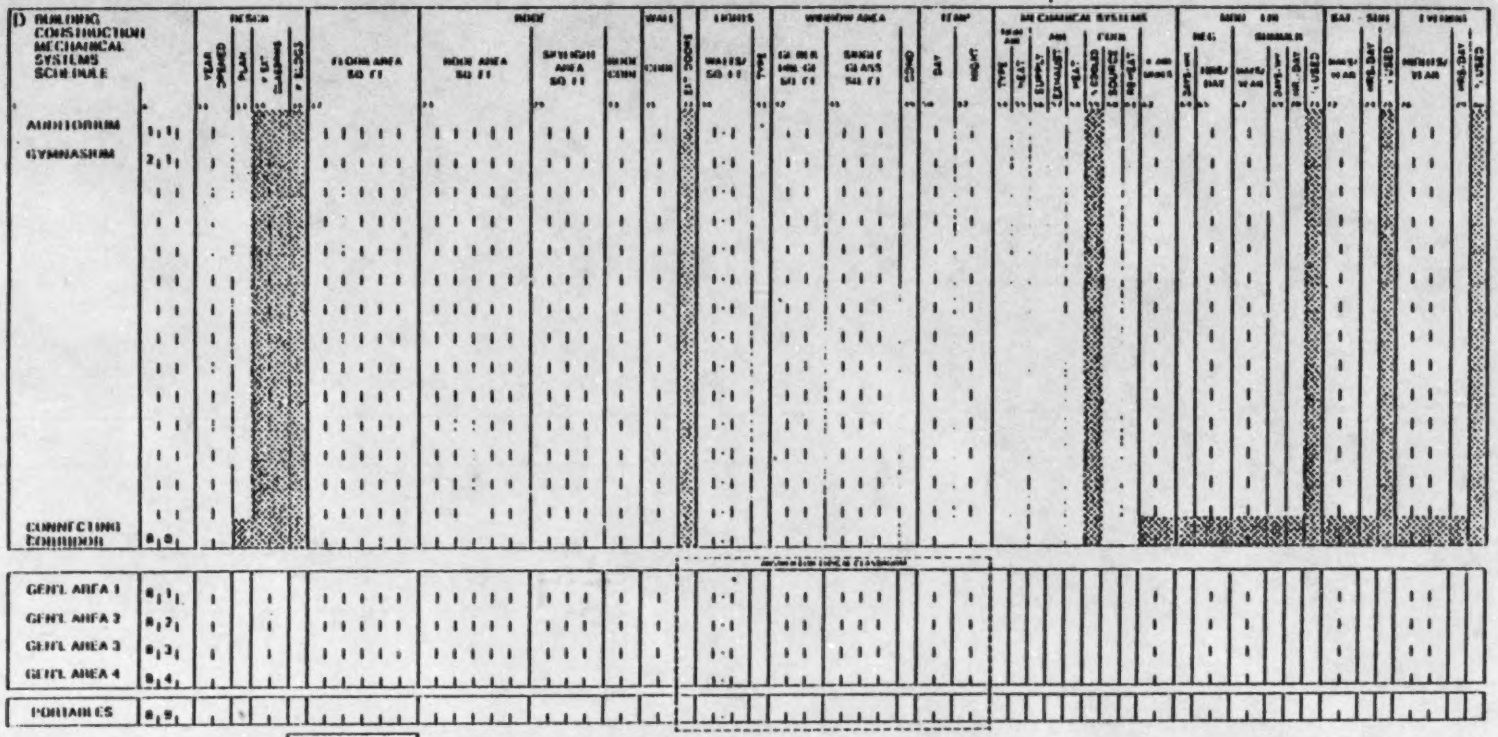
COL 60-69 NEPCA
Save Instruction Manual pages for Schedule

* Boiler plant planning panel for that community
All other shows are night published

112

116

11



PSECS PUBLIC SCHOOLS ENERGY CONSERVATION SERVICE

APPENDIX G

MONTHLY AND ANNUAL HEATING AND COOLING DEGREE DAY NORMALS

OKLAHOMA

MONTHLY AND ANNUAL HEATING DEGREE DAY NORMALS

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
ADA	0	0	7	108	384	687	747	546	427	128	16	0	3030
ALTUS IRR. RESCH STN	0	0	0	103	402	688	775	571	440	124	12	0	3115
ALVA	0	0	17	152	513	834	911	684	578	215	51	0	3865
AMADARKO	0	0	6	122	435	722	818	589	483	137	18	0	3321
ANTLERS 3 ENE	0	0	0	110	370	642	719	532	395	108	16	0	2890
APACHE	0	0	0	116	420	710	800	591	458	137	31	0	3253
ARDMORE	0	0	0	88	323	598	691	501	378	93	8	0	2682
ARNETT	0	0	18	183	548	837	930	720	616	244	75	6	4180
BARTLESVILLE 2 W	0	0	13	163	488	818	918	686	556	186	38	0	3878
BEAVER 1 SW	0	0	18	205	585	877	948	728	624	248	71	11	4317
BLACKWELL 1 W	0	0	17	150	488	828	921	682	567	201	60	0	3834
BOISE CITY 2 E	0	0	30	256	624	887	992	753	688	338	118	15	4661
BRISTOW	0	0	13	132	450	793	848	630	504	170	38	0	3538
BUFFALO	0	0	19	197	525	834	911	692	577	208	68	8	3988
CARNEGIE 4 ENE	0	0	7	134	456	747	840	619	484	147	21	0	3495
CHANDLER MB 1	0	0	11	131	438	741	834	624	484	148	32	0	3451
CHATTANOOGA 3 NE	0	0	0	105	411	694	781	571	434	128	17	0	3141
CHEROKEE POWER PLANT	0	13	10	196	516	831	909	683	548	228	46	0	3837
CHICKASHA EXP STATION	0	0	7	128	444	735	825	608	474	150	23	0	3384
CLAREMORE 2 ENE	0	0	15	158	477	781	880	664	530	177	43	0	3725
CLEVELAND	0	0	7	128	447	753	853	633	500	153	21	0	3498
CLINTON	0	0	7	147	486	781	868	650	523	177	38	0	3678
CLOUD CHIEF 2 SE	0	0	8	135	465	796	837	630	511	173	38	0	3593
CORDELL	0	0	8	132	458	747	834	627	484	168	31	0	3501
CUSHING	0	0	15	148	474	784	886	675	544	171	53	0	3761
DUNCAN	0	0	0	96	382	670	763	557	425	118	18	0	3027
DURANT SE STATE COL	0	0	0	86	355	623	704	518	395	103	9	0	2803
EL RENO 1 N	0	0	11	140	480	775	871	661	532	184	44	0	3698
ELK CITY	0	0	11	158	492	781	858	655	534	194	45	0	3730
ENID	0	0	10	135	477	781	884	664	540	188	41	0	3718
FORT SUPPLY DAM	0	0	16	168	528	828	915	694	598	219	65	6	4031
FREDERICK	0	0	0	88	367	645	728	526	400	106	20	0	2882
GEARY	0	0	12	138	462	786	893	641	522	172	32	0	3598
GOODWELL	0	0	15	206	597	859	921	717	638	278	79	10	4321
GRAND RIVER DAM	0	0	12	152	485	778	874	668	543	185	45	0	3783
GUTHRIE 2 WNW	0	0	8	142	456	788	896	644	508	168	28	0	3677
HARPER	0	0	14	160	501	781	868	655	534	186	47	5	3781
HENNESSEY 1 N	0	0	6	141	477	781	877	658	527	182	38	0	3685
HOBART FAA AIRPORT	0	0	6	141	480	772	898	647	521	175	33	6	3634
HOLDENVILLE	0	0	0	110	393	682	781	574	490	131	17	0	3138
HOLLIS	0	0	0	114	429	710	794	582	455	125	15	0	3224
HOOKER 1 N	0	0	15	222	606	887	958	746	654	285	94	15	4481
HUGO	0	0	0	88	348	608	685	507	372	91	10	0	2709
IDABEL	0	0	0	91	358	617	676	507	378	97	10	0	2734
JEFFERSON	0	0	10	145	510	825	915	688	558	206	58	0	3814
KENTON	0	0	28	245	615	877	942	745	686	337	98	21	4597
KINGFISHER	0	0	8	128	468	778	862	644	510	175	31	0	3604
LAWTON	0	0	0	108	412	684	784	574	437	123	15	0	3147
MADILL	0	0	0	89	348	620	710	518	392	106	8	0	2791
MANGUM RESEARCH STA	0	0	0	121	435	716	797	591	463	148	23	0	3284
MARIETTA 3 NW	0	0	0	86	342	614	688	507	385	101	9	0	2742
MARLOW 1 WSW	0	0	7	108	396	688	781	574	442	128	20	0	3145
MCALESTER FAA AIRPORT	0	0	7	129	414	704	797	591	455	140	22	0	3255
MEEKER 1 E	0	0	8	140	435	732	828	608	480	148	22	0	3401
MIAMI	0	0	16	152	477	787	884	664	532	177	45	0	3734
MUSKOGEE	0	0	7	138	432	722	809	599	469	134	25	0	3335
MUTUAL	0	0	10	169	528	831	918	703	588	232	73	0	4052
NEWKIRK	0	0	17	156	513	840	933	703	571	205	50	0	3988
NORMAN 3 S	0	0	6	109	411	710	809	591	456	136	19	0	3247
NOWATA	0	0	14	163	504	825	918	684	576	213	62	0	3959
OAKWOOD 3 SW	0	0	12	144	507	809	896	680	554	202	52	0	3856
OKEENE	0	0	10	131	471	781	874	652	525	187	47	0	3678
OKEMAH	0	0	10	124	414	707	806	594	470	138	20	0	3284
OKLAHOMA CITY PENN AVE	0	0	6	123	444	741	840	622	484	161	28	0	3457
OKLAHOMA CITY WSFO	0	0	12	148	474	775	874	664	532	180	36	0	3695
OKMULGEE WATER WORKS	0	0	9	137	432	725	828	616	488	143	23	0	3401
PAULS VALLEY	0	0	0	106	405	701	784	568	436	118	15	0	3133
PAWHUSKA	0	0	18	162	504	812	908	680	551	187	49	0	3871
PERRY	0	0	9	124	447	756	849	633	500	162	35	0	3515
PONCA CITY	0	0	8	139	468	784	884	652	525	171	31	0	3672
POTEAU	0	0	0	118	387	657	741	546	425	113	14	0	3001
PRYOR	0	0	10	157	489	787	887	668	543	192	42	0	3776
SALLISAW	0	0	0	133	432	719	800	602	470	130	21	0	3307
SAYRE 1 NE	0	0	7	148	492	772	853	647	517	171	39	0	3646
SHAWNEE	0	0	7	128	426	719	815	602	469	147	23	0	3336

OKLAHOMA

MONTHLY AND ANNUAL HEATING DEGREE DAY NORMALS

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
SPAVINAW	0	0	7	124	426	725	822	615	486	180	30	0	3411
STILLWATER 2 W	0	0	10	148	465	772	865	644	517	174	38	0	3631
SULPHUR PLATT NATL PK	0	0	5	105	384	673	753	548	417	115	13	0	3024
TAHLEQUAH 1 SE	0	0	12	163	480	756	837	630	506	181	42	0	3587
TIPTON 4 S	0	0	0	108	417	704	787	585	453	135	18	0	3217
TISHOMINGO NATIONAL WL	0	0	0	101	367	642	725	529	400	112	10	0	2886
TULSA WSO	0	0	10	143	468	781	880	686	528	176	28	0	3680
VINITA 3 NNE	0	0	17	170	498	803	899	680	554	188	55	0	3864
WAGONER	0	0	10	144	447	753	846	627	489	156	24	0	3498
WALTERS	0	0	8	100	378	657	747	543	409	114	13	0	2981
WAURIKA	0	0	0	98	393	629	713	512	382	98	8	0	2793
WAYNOKA	0	0	11	169	519	834	908	689	569	189	69	0	3958
WEATHERFORD	0	0	9	138	471	763	853	638	510	172	34	0	3588
WEBBERS FALLS	0	0	0	143	450	747	837	636	501	164	22	0	3499
WICHITA MT WL REF	0	0	9	140	462	738	818	613	483	144	28	0	3435
WOODWARD	0	0	12	183	516	809	880	675	558	198	54	0	3883

MONTHLY AND ANNUAL COOLING DEGREE DAY NORMALS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
ADA	0	0	21	65	168	387	546	533	285	102	5	0	2122
ALTUS IRR. RESCH STN	0	0	18	73	214	458	598	577	318	87	0	0	2394
ALVA	0	0	14	41	150	395	561	533	266	71	0	0	2031
ANADARKO	0	0	13	56	174	402	559	543	285	79	0	0	2107
ANTLERS 2 ENE	0	0	17	61	180	383	530	515	288	84	0	0	2078
APACHE	0	0	15	53	170	396	552	548	298	82	0	0	2115
ARDMORE	0	0	25	90	220	444	588	588	351	120	8	0	2444
ARNETT	0	0	8	28	121	327	477	456	211	54	0	0	1682
BARTLESVILLE 2 W	0	0	14	48	143	351	505	481	232	64	0	0	1838
BEAVER 1 SW	0	0	10	24	127	347	498	468	216	47	0	0	1738
BLACKWELL 1 W	0	0	12	54	178	402	561	539	284	88	0	0	2118
BOISE CITY 2 E	0	0	0	11	98	246	384	338	126	15	0	0	1179
BRISTOW	0	0	14	65	193	380	508	498	268	76	0	0	1943
BUFFALO	0	0	13	40	187	389	548	521	298	67	0	0	2003
CARNEGIE 4 ENE	0	0	16	57	179	414	567	536	286	78	0	0	2133
CHANDLER NO 1	0	0	16	53	193	389	527	521	272	84	0	0	1995
CHATTANOOGA 3 NE	0	0	15	58	188	432	583	577	322	90	0	0	2266
CHEROKEE POWER PLANT	0	0	9	66	157	405	564	524	262	75	0	0	2062
CHICKASHA EXP STATION	0	0	16	60	169	396	538	518	288	72	0	0	2038
CLAREMORE 2 ENE	0	0	12	48	152	351	505	487	252	81	0	0	1888
CLEVELAND	0	0	13	60	180	381	536	521	271	73	0	0	2019
CLINTON	0	0	11	45	157	390	536	518	256	81	0	0	1974
CLOUD CHIEF 2 SE	0	0	12	47	165	402	558	533	278	79	0	0	2074
CORDELL	0	0	13	48	167	405	556	539	284	79	0	0	2094
CUSHING	0	0	17	48	177	378	536	521	273	87	0	0	2035
DUNCAN	0	0	22	82	195	411	567	564	323	99	0	0	2283
DURANT SE STATE COL	0	0	23	73	195	411	552	548	303	99	10	0	2215
EL RENO 1 N	0	0	12	43	149	363	518	503	251	66	0	0	1907
ELK CITY	0	0	10	47	151	389	515	487	230	54	0	0	1883
ENID	0	0	13	45	158	393	552	533	271	76	0	0	2041
FORT SUPPLY DAM	0	0	13	38	146	383	508	487	232	59	0	0	1846
FREDERICK	0	0	25	88	237	474	629	626	364	123	0	0	2566
GEARY	0	0	14	46	156	384	549	536	279	83	0	0	2047
GOODWELL	0	0	0	11	88	298	437	403	171	28	0	0	1434
GRAND RIVER DAM	0	0	16	56	150	354	508	490	246	78	0	0	1898
GUTHRIE 2 WNW	0	0	12	57	181	384	546	536	276	89	0	0	2081
HARPER	0	0	13	46	156	392	539	502	242	58	0	0	1947
HENNESSEY 1 N	0	0	12	47	169	408	564	549	282	95	0	0	2126
HOBART FAA AIRPORT	0	0	9	43	161	411	564	546	270	70	0	0	2074
HOLDENVILLE	0	0	16	62	166	384	539	533	282	97	0	0	2089

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OKLAHOMA

MONTHLY AND ANNUAL COOLING DEGREE DAY NORMALS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
HOLLIS	0	0	17	68	228	477	617	582	318	88	0	0	2404
HOOKER 1 N	0	0	0	18	100	315	456	415	180	36	0	0	1520
HUGO	0	0	18	70	202	414	548	533	312	103	6	0	2207
IDABEL	0	0	21	58	186	393	524	518	287	88	7	0	2082
JEFFERSON	0	0	10	41	159	396	552	527	258	67	0	0	2011
KENTON	0	0	0	13	53	261	384	383	140	18	0	0	1251
KINGFISHER	0	0	11	52	184	408	564	548	287	76	0	0	2110
LAWTON	0	0	18	60	186	417	567	561	308	87	0	0	2203
MADILL	0	0	20	73	197	414	567	564	318	110	6	0	2269
MANGUM RESEARCH STA	0	0	16	73	200	426	574	548	285	84	0	0	2207
MARIETTA 3 NW	0	0	22	80	201	426	580	577	336	114	8	0	2345
MARLOW 1 WSW	0	0	17	57	183	378	533	533	282	87	0	0	2060
MCALESTER FAA AIRPORT	0	0	15	65	171	393	543	533	288	87	0	0	2106
MEEKER 1 E	0	0	15	64	181	381	530	518	278	91	0	0	2038
MIAMI	0	0	14	48	150	368	505	480	253	76	0	0	1893
MUSKOGEE	0	0	17	53	168	378	533	518	280	91	0	0	2038
MUTUAL	0	0	8	31	138	371	527	505	235	57	0	0	1872
NEWKIRK	0	0	13	43	146	363	521	488	248	68	0	0	1902
NORMAN 3 S	0	0	16	61	168	387	538	530	288	78	0	0	2067
NOWATA	0	0	11	42	143	338	512	480	238	63	0	0	1838
OAKWOOD 3 SW	0	0	12	40	138	364	515	483	237	48	0	0	1847
OKEENE	0	0	13	52	174	414	570	548	283	78	0	0	2133
OKEMAH	0	0	17	52	148	383	515	508	274	83	0	0	1970
OKLAHOMA CITY PENN AVE	0	0	14	62	163	390	546	527	278	76	0	0	2057
OKLAHOMA CITY WSFO	0	0	11	42	138	354	512	488	252	68	0	0	1876
OKMULGEE WATER WORKS	0	0	20	56	153	388	502	480	252	78	0	0	1917
PAULS VALLEY	0	0	17	73	201	432	577	561	310	87	0	0	2258
PAWHUSKA	0	0	14	55	148	348	505	487	237	63	0	0	1857
PERRY	0	0	13	60	168	384	539	530	278	87	0	0	2060
PONCA CITY	0	0	13	54	187	396	552	533	275	90	0	0	2080
POTEAU	0	0	25	82	178	396	552	530	295	96	0	0	2134
PRYOR	0	0	13	54	147	354	505	487	238	67	0	0	1885
SALLISAW	0	0	14	49	164	372	512	496	270	86	0	0	1963
SAYRE 1 NE	0	0	12	46	163	387	536	518	253	61	0	0	1975
SHAWNEE	0	0	14	57	147	388	521	505	285	78	0	0	1956
SPAVINAW	0	0	15	58	154	366	518	508	277	87	0	0	1983
STILLWATER 2 W	0	0	15	57	148	363	521	505	256	81	0	0	1847
SULPHUR PLATT NATL PK	0	0	18	64	171	396	548	548	311	86	0	0	2194
TAHLEQUAH 1 SE	0	0	13	50	135	330	471	453	231	60	0	0	1743
TIPTON 4 S	0	0	19	69	207	450	589	561	304	87	0	0	2286
TISHOMINGO NATIONAL WL	0	0	16	70	187	411	548	536	300	92	0	0	2158
TULSA WSO	0	0	10	50	145	389	530	508	259	78	0	0	1848
VINITA 3 NNE	0	0	12	35	141	348	488	481	238	74	0	0	1827
WAGONER	0	0	15	66	183	381	543	521	277	94	0	0	2080
WALTERS	0	0	22	81	211	447	601	595	340	106	0	0	2403
WAURIKA	0	0	26	93	223	444	582	589	342	121	0	0	2430
WAYNOKA	0	0	14	40	171	395	552	527	251	69	0	0	2019
WEATHERFORD	0	0	11	46	158	390	538	518	264	67	0	0	1993
WEBBERS FALLS	0	0	14	62	165	381	533	508	272	77	0	0	2012
WICHITA MT WL REF	0	0	15	54	152	372	527	518	264	83	0	0	1985
WOODWARD	0	0	16	40	153	378	530	502	237	58	0	0	1914

ATION	DIV	NAME	LAT	LONG	ELEV
0017	08	ADA	N3447	W09641	1015
0179	07	ALTUS IRR. RESCH STN	N3435	W09920	1380
0193	02	ALVA	N3648	W09839	1374
0224	07	ANADARKO	N3504	W09814	1180
0256	09	ANTLERS 2 ENE	N3413	W09538	465
0260	07	APACHE	N3434	W09822	1300
0292	08	ARDMORE	N3410	W09708	880
0332	01	ARNETT	N3608	W09946	2455
0348	03	BARTLESVILLE 2 W	N3645	W09600	719
0393	01	BEAVER 1 SW	N3648	W10031	2300
0814	02	BLACKWELL 1 W	N3648	W09718	1038
0908	01	BOISE CITY 2 E	N3644	W10229	4169
1144	05	BRISTOW	N3530	W09624	829
1243	01	BUFFALO	N3630	W09937	1795
1504	07	CARNEGIE 4 ENE	N3508	W09833	1340
1684	05	CHANDLER NO 1	N3542	W09653	980
1706	07	CHATTANOOGA 3 NE	N3427	W09837	1154
1724	02	CHEROKEE POWER PLANT	N3646	W09821	1180
1750	02	CHICKASHA EXP STATION	N3503	W09755	1083
1828	03	CLAREMORE 2 ENE	N3619	W09535	588
1900	03	CLEVELAND	N3619	W09628	815
1909	04	CLINTON	N3531	W09858	1610
1927	04	CLOUD CHIEF 2 SE	N3514	W09849	1300
2125	04	CORDELL	N3517	W09859	1540
2310	03	CUSHING	N3559	W09646	930
2660	08	DUNCAN	N3430	W09757	1125
2678	08	DURANT SE STATE COL	N3401	W09623	675
2818	05	EL RENO 1 N	N3533	W09758	1315
2849	04	ELK CITY	N3525	W09925	1950
2912	02	ENID	N3625	W09752	1249
3304	02	FORT SUPPLY DAM	N3633	W09935	2075
3353	07	FREDERICK	N3424	W09901	1300
3497	04	GEARY	N3537	W09819	1575
3628	01	GOODWELL	N3636	W10139	3297
3700	03	GRAND RIVER DAM	N3628	W09503	766

STATION	DIV	NAME	LAT	LONG	ELEV
3821	05	GUTHRIE 2 WNW	N3553	W09727	980
3871	04	HAMMON	N3538	W09923	1780
4035	05	HENNESSEY 1 N	N3607	W09754	1170
4204	07	HOBART FAA AIRPORT	N3500	W09903	1352
4235	06	HOLDENVILLE	N3503	W09624	915
4249	07	HOLLIS	N3441	W09955	1615
4298	01	HOOKER 1 N	N3653	W10113	3015
4384	09	HUGO	N3401	W09530	370
4451	09	IDABEL	N3353	W09449	480
4573	02	JEFFERSON	N3643	W09748	1070
4786	01	KENTON	N3634	W10258	4350
4861	05	KINGFISHER	N3551	W09756	1060
5063	07	LAWTON	N3437	W09827	1130
5468	08	MADILL	N3405	W09646	770
5509	07	MANGUM RESEARCH STA	N3450	W09926	1320
5563	08	MARIETTA 3 NW	N3359	W09707	865
5581	08	MARLOW 1 WSW	N3439	W09759	1230
5664	06	MCALESTER FAA AIRPORT	N3453	W09547	780
5779	05	MEEKER 1 E	N3530	W09653	945
5855	03	MIAMI	N3653	W09452	795
6130	06	MUSKOGEE	N3545	W09520	595
6139	02	MUTUAL	N3614	W09910	1865
6278	02	NEWKIRK	N3653	W09704	1135
6386	05	NORMAN 3 S	N3511	W09727	1109
6485	03	NOWATA	N3642	W09538	720
6562	04	OAKWOOD 3 SW	N3554	W09844	1746
6629	04	OKEENE	N3607	W09819	1200
6638	05	OKEMAH	N3526	W09618	935
6656	05	OKLAHOMA CITY PENN AVE	N3528	W09733	1200
6661	05	OKLAHOMA CITY WSFO	N3524	W09736	1289
6670	06	OKMULGEE WATER WORKS	N3537	W09601	643
6926	08	PAULS VALLEY	N3443	W09713	875
6935	03	PAWHUSKA	N3640	W09621	835
7012	02	PERRY	N3617	W09718	1025
7196	02	PONCA CITY	N3642	W09705	1019

STATION	DIV	NAME	LAT	LONG	ELEV
7246	09	POTEAU	N3504	W09438	572
7309	03	PRYOR	N3619	W09519	660
7862	06	SALLISAW	N3528	W09447	531
7951	04	SAYRE 1 NE	N3518	W09937	1900
8110	05	SHAWNEE	N3519	W09656	1025
8380	03	SPAVINAW	N3623	W09503	685
8501	05	STILLWATER 2 W	N3607	W09705	895
8587	08	SULPHUR PLATT NATL PK	N3430	W09658	990
8677	06	TAHLEQUAH 1 SE	N3554	W09456	846
8879	07	TIPTON 4 S	N3426	W09908	1355
8884	08	TISHOMINGO NATIONAL WL	N3411	W09838	642
8992	03	TULSA WSO	N3611	W09554	668
9203	03	VINITA 3 NNE	N3641	W09508	737
9247	03	WAGONER	N3558	W09522	590
9278	07	WALTERS	N3421	W09819	993
9395	08	WAURIKA	N3410	W09800	875
9404	02	WAYNOKA	N3635	W09852	1310
9422	04	WEATHERFORD	N3532	W09842	1650
9445	06	WEBBERS FALLS	N3531	W09508	480
9629	07	WICHITA MT WL REF	N3446	W09843	1665
9760	02	WOODWARD	N3627	W09923	1900

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